ENGINEERS AND ENGINEERING IN OTHER LANDS.

(Specially translated and prepared from our Exchanges.)

A recent number of the Cologne *Gazette* has a long communication from its correspondent on the Isthmus. We give herewith a condensed translation: The number of workmen that have been employed since the beginning of the works varied from 7,000 to 13,000. A rather remarkable circumstance, however, is that about 1,000 were always in hospital. West India negroes were "imported" to a considerable extent through the agency of two German houses, one in Panama, and the other in Kingston, Jamaica. From the latter-mentioned place, it would seem that negroes may be had *ad libitum* (a wink for contractors in Southern climes). One shilling (25 cents) is the usual daily wages of the negro in the West India Islands; but, it is said that they do not earn even this modest sum. However, bad as they are, 2,000 of them are now digging *at* the Canal. The native *mestites* are employed in the more congenial occupation of clearing the forests. These people have come even from Bolivar province, Columbia and from Venezuela. Chinese would seem not competent, and certainly past experience on the Panama Railroad would fortify this position, a great many of them even committed suicide; and one place has been baptized with the name of *Mata Chinos* (Chinese death). A rock, that with full tide would be washed by the ocean, was the favorite place for this manner of anticipating fate. A great many of those who preferred to stay in the world are now engaged in other and more profitable occupations than digging canals. A few, but very few, Europeans are engaged in manual work on the Canal. A dollar a day is the wages paid the ordinary workman, but one and a half dollars are now asked. Work begins at 7 a. m. The engineers employed have, of course, suffered, but not to such an extent as was supposed.

The Austrian civil engineers and draughtsmen are at last up in arms against that exceedingly kind disposition to forget that the "laborer is worthy of his hire." Architectural draughtsmen have especially suffered in Germany, as large factories would engage to furnish plans, etc., gratis.

The German Corporation of Civil Engineers who have their headquarters in Berlin have lately endeavored to stop this eternal cutting down of prices, by fixing a regular standard of prices, which would be so serviceable, even before the courts. The scale of fees that has been drawn up is as follows:

Consultations at home, orally or by letter	$2.50
Answers and simple information not under	1.25
Opinions in writing, preferably by agreement not under	2.50
Answers and simple information not under	1.25
Answers and simple works, with several hours activity (!) (*bei mehrstuendiger Thaetigkeit*) up to	10.00
Taxes, expert rates, traveling expenses, outside the cash expenses per day of eight hours at least from $10.00 to	15.00
For draughts, plans, estimates, inspection of works, a percentage according to sum of from ¼ of 1 per cent to 10 per cent	

These prices, it is consoling to know, at least to American engineers, are considered as *minima*, and are varied, upward, according to the capacity and reputation of the engineer.

The French and Germans are meditating great engineering projects, which, if carried out, will give employment to a great many engineers. These schemes are so vast in themselves that a separate consideration of them becomes absolutely necessary. The principal, the Nile irrigation scheme, the creation of a canal from Bordeaux to a point on the Mediterranean near Cette; the formation of a great interior sea to the south of Algeria and Tunis; the Dartmunds-Emshaven Canal, a project on the tapis for the last twenty-five years, to connect the great Westphalian manufacturing district with the ocean, and the much spoken-of railway through Asia Minor to Persia and India are the projects which are to employ the accumulated savings of Europe. The Nile project may be said to be one of the most fanciful, and would consist in creating vast irrigation works on the Upper Nile. Several engineers have already surveyed the country, and it is thought that M. de la Motte may eventually succeed in engaging European capital in the plan.

The Dartmund-Emshaven Canal will have sufficient depth to allow of vessels coming into the very heart of the coal and iron region of Westphalia. The width at bottom will be 16 meters, but no very definite plan seems as yet to have been adopted.

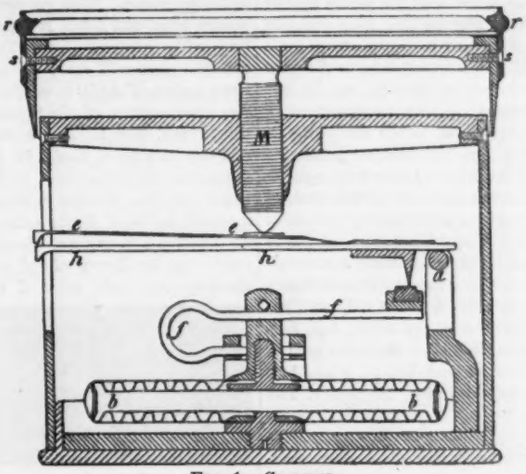


FIG. 1.—SECTION

At a late meeting of the French Civil Engineers a paper was read from M. Cotard on the general uses of water in furthering works for improving the navigability of rivers, etc. According to the author there is a great difference between torrential and quiet streams, although both may be met in the basin of a river. The studies with regard to the Seine were continued during twenty-five years until now a freshet or rise in the river is known two or three days in advance. He advanced the theory that the beds of the rivers present a series of pits or wells, separated by thresholds or borders, and that the natural action of water was to lower these separations. Dredging or narrowing the banks tended only to increase the rate of spead of a river but not to increase its depth, but the contrary. Between a system of dams and a lateral canal, he would prefer the latter, although many engineers are in favor of a mixed system. Raise the levels, and diminish the velocity, were the best means for permanently increasing depth.

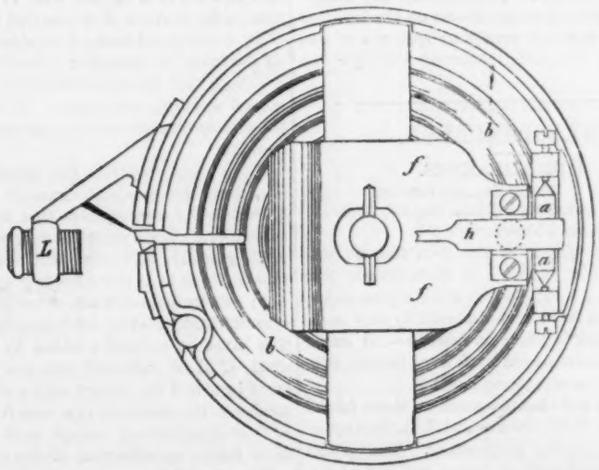


FIG. 2.—VIEW WITH CASE OFF.

The aneroids used in the Gothard tunnel works gave great satisfaction. They were known as the Goldschmid, and have been further improved by Hottinger, of Zurich. An order for 42 of the so-called leveling barometers was lately given by the Spanish government, and for four of the self-

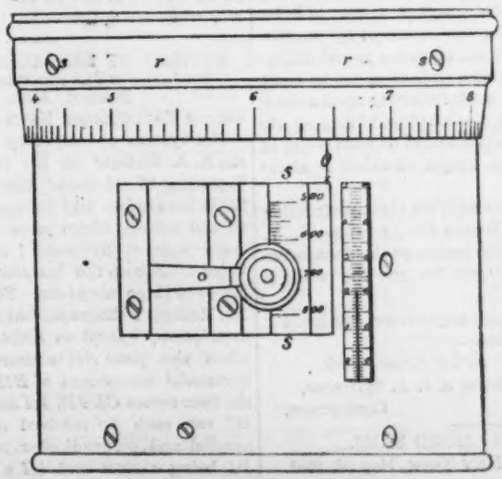


FIG. 3.—LONGITUDINAL VIEW.

registering, aneroid barographs. A case or box, made of German silver, and almost void of air, is the general make. In the Goldschmid instruments there are no special detents in the cases, but the metal is so thick that the plates appear flat and parallel after the air has been pumped out. The pressure of the air is shown either on a lever system, to which it is transferred or directed by a micrometer screw, or finally, as in the Weilenmann instrument, by the combination of five or six cases, but these latter are difficult to carry, and have not fulfilled expectations and required several months to recover an equilibrium. Fig. 1 gives a sectional cut, natural size, of the Goldschmid aneroid for engineering purposes. The motion of the center of the case is here transferred by an arm to a lever and suitably increased. A decent is now used, which increases the delicacy without increase of size, the arm not only making the same movement as the center piece, but proportionately greater as the end of the lever arm in the instruments of Naudet and Reitz. Figs. 1, 2 and 3 show the improved leveling barometer. The air-exhausted case *b b* (Figs. 1 and 2) is made tense by the steel springs *f f*, and transmits its movements by this to the lever arm *h h*, rotating round the axis *a*. The verifying spring *e e* is screwed on the lever, and the contact of the micrometer screw *M*, with which the action of the case under changed air pressure is measured, and which could not be accurately enough determined by simply feeling with the hand, is produced by the coincidence of two lines that are drawn on the front of the lever *h h* and the verifying spring *e e*, and which can be accurately observed through the loop *L*.

CORRESPONDENCE.

TIDE BREAKERS.

MOON ISLAND OFFICE,
ATLANTIC, Mass., May 22, 1882.

EDITOR ENGINEERING NEWS:

I see by your paper of the 20th that 50 tide breakers were carried away at Portsmouth, etc. That is so. But I would like to add for your information that they have been replaced by new ones, and that the work is going on rapidly—100 cubic yards having been removed by J. A. Sylvester, contractor, the last month (since April 5).

And I wish to add that the work at Moon Island outlet sewer (by C. W. Parker and J. A. Sylvester, contractors) is rapidly progressing. The *gravel* filling for embankment is being put in by locomotive and cars, the gravel being dredged near by and dumped on to cars which run down to the dredger on trestle work, and from there drawn up to the embankment on which the sewer is being built. A new steam shovel is at work excavating for great reservoir at outer end of sewer, and the material is hauled up to embankment by another train of cars and placed upon the gravel filling. The stone masonry at both ends of sewer is being built, as also the brick work following up the stone masonry. Vessels are also employed bringing rip rap and ballast for the protection of both sides of the embankment, the length of which is about one mile.

Messrs. Parker & Sylvester are also constructing a large dock at South Boston Flats for the N. Y. & N. E. Railroad Co., the length of the dock when completed to be about 1,400 ft., and the work is going on rapidly.

I send you this without any advice, but know it will meet their approval.

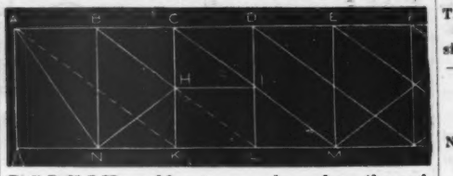
JAS. F. COBB, Clerk,
With C. W. Parker & J. A. Sylvester,
Contractors.

REPLACING CHORD BARS.

NEW YORK, May 23, 1882.

EDITOR ENGINEERING NEWS:

I was surprised to learn from Mr. Loweth's last letter that I had not fully understood the details of his problem as given by him. Studying it more closely I believe I now fully comprehend it. He wished to replace the chord piece *K L*, by ⋃ rods passing around the piers from panel point *L* or *M* and the diagonals *A K* and *B L* and verticals *C K* and *D L* by a temporary truss *B C D E I H*, so to speak, supported at *B* and *E*, and wishes to know if these additions would make the modified truss self-supporting. With proper bracing in the temporary truss and point *N* supported by the ⋃ rods they will; otherwise not. The ⋃ rods from *M* or *L* to the piers will carry the entire strain between those points if made to support the panel point *N*. An examination of the figure will show this. If this is true, then the entire chord between *M* or *L* and the abutment could be removed without endangering the structure. If *N* is not supported by these rods then it must be supported in some other manner, as by *N H*, for example. There need be no question, therefore, about providing for the strain in the lower chord, consequently lack of stability can only arise if the temporary truss



B C D E I H would not properly replace the web members which would be thrown out of action. An examination of the figure shows that the strain in the vertical *D I* is equal to that in the vertical *F O*, carried to *D* by diagonal *D O*, + the panel-load of truss in *D L*, and that in *C H* is equal to that in the vertical *E M*, carried to *C* by diagonal *C M*, + the panel-load of truss in *C K*. These are all the loads the temporary truss has to carry, and are those that the members which were to be removed would have to carry. From *B* the route of the strains on their way to the abutment is clear enough.

If the temporary truss can be made self-supporting, then the modified truss is self-supporting. If load in *D I* were equal to that in *C H* no bracing in temporary truss would be necessary for stability. A little study, however, will convince anybody that the load in *C H* is *always* greater than that in *D I*; our temporary truss, therefore, is *always* unsymmetrically loaded, and tends to sink in *C*, and this must be resisted; either by a tie, *D H*, or a strut, *C I*, of sufficient strength to equalize the loads in *C* and *D*. Insert such a piece, and all the strains in the truss are provided for while work in *K L* is progressing, except such as might arise from faulty construction of the temporary work.

This is only one method of solving the question. Others could be worked out that would be equally satisfactory. Another method which I used very successfully in replacing the lower chord of a Howe truss, would be to underpin the truss in the panel points *K* and *L*, and insert a counter-tie, *N C* while doing the work. E. A. RUDIGER.

METHOD OF REPLACING CHORD BARS.

ST. LOUIS & SAN FRANCISCO RAILWAY CO.
PORTER, ARK., May 16, 1882.

EDITOR ENGINEERING NEWS:

The system of temporary trussing proposed by Mr. E. A. Rudiger in his letter on "Method of Replacing Chord Bars," ENGINEERING NEWS, May 13, is incomplete and incapable of transmitting all the strains which exist in the truss. At the lower ends of *BH* and *CI* there is no piece provided to take up the horizontal component of the forces in these members. The tie *HI*, shown on Mr. Rudiger's diagram, but not mentioned in the description, except as resisting the chord strain when the piece *NH* is inserted, will carry the horizontal component of *BH* to *I* where we have the four forces *CI*, *IM*, *HI* and *DI*. Then *DI* and *HI* can each be resolved into two components, parallel and perpendicular to *CIM* respectively. *DI* being a strut and *HI* a tie, the two perpendicular components will act together, and it is necessary to introduce a tie, *IE*, in order to resist this component and make the truss complete and self-sustaining.

The chord strain may be taken up by the method used by Assistant Engineer, or as proposed by Mr. Rudiger. It may be well to notice that the strains in *BN*, *BH*, *HI*, *IM*, *IE* and *EM* are much greater when the latter method is used. For example, since the shear remains the same, the strain in *BH* is increased by the amount of that in *NH*. Whether the strains are dangerously increased depends, of course, entirely on the circumstances of the case.

JOS. A. BEAUMONT.

TABLE FOR ANGLES IN PLATE GIRDERS.

THE CLARKE BRIDGE CO.,
BALTIMORE, May 23, 1882.

EDITOR ENGINEERING NEWS:

In the last number of ENGINEERING NEWS, under Correspondence, "Table for Angles in Plate Girders," I observe that one of your readers would like to obtain a table for computing rapidly the net and gross sections of angles.

Having had a large number of plate girders,

TABLE SHOWING ALLOWABLE STRAIN ON ANGLES.

Taking tension 10,000 lbs. per sq. in. net section; compression, 8,000 lbs. per sq. in. gross section.

No.	ANGLES.	Area.	TENSION, DEDUCTING. 2⅜" rivets.	2¾" rivets.	3⅛" rivets.	Compression gross.
2	2¾"×2"×¼"	2.10	17,900	17,300	16,600	16,800
"	" " 5-16"	2.46	20,700	19,900	19,100	19,680
"	" ⅜"	2.90	24,300	23,400	22,400	23,200
2	2¼"×2¼"×¼"	2.30	19,600	19,000	18,600	18,400
"	" 5-16"	2.94	25,500	24,700	23,900	23,520
"	" ⅜"	3.24	27,700	25,800	25,800	25,920
"	" 7-16"	3.80	32,500	31,400	30,300	30,400
2	2½"×2½"×¼"	2.42	21,100	20,500	19,800	19,360
"	" 5-16"	3.14	27,500	26,700	25,900	25,120
"	" ⅜"	3.66	31,900	31,000	30,000	29,280
"	" 7-16"	4.08	35,300	34,200	33.100	32,640
2	2¾"×2¾"×5-16"	3.36	29,700	28,900	28,100	26,880
"	" ⅜"	3.86	33,900	33,000	32,000	30,880
"	" 7-16"	4 56	40,100	39,000	37,900	36,480
"	" ½"	5.34	47,200	45,900	44,700	42,720
2	3"×3"×5-16"	3.66	32,700	31,900	31,100	29,280
"	" ⅜"	4.20	37,300	36,400	35,400	33,600
"	" 7-16"	5 04	44,900	43,800	42,700	40,320
"	" ½"	5.52	49,000	47,700	46,500	44,160
"	" 9-16"	6.36	56,600	55,200	53,800	50,880
2	3½"×3½"×⅜"	4.86	43,900	43,000	42,000	38,880
"	" 7-16"	5.66	51,100	50,000	48,900	45,280
"	" ½"	6.62	60,000	58,700	57,500	52,960
"	" 9-16"	7.70	70,000	68,800	67,200	61,600
"	" ⅝"	8.88	81,000	79,400	77,900	71,040
2	4"×4"×7-16"	6.84	62,900	61,800	60,700	54,720
"	" ½"	7.56	69,400	68,100	66,900	60,480
"	" 9-16"	8.48	77,800	76,400	75,000	67,840
"	" ⅝"	9.20	84,200	82,600	81,100	73,600
2	6"×6"×7-16"	10.10	95,500	94,400	93,300	80,800
"	" ½"	11.60	109,800	108,500	107,300	92,800
"	" 9-16"	13.10	124,000	122,600	121,200	104,800
"	" ⅝"	14.60	138,200	136,600	135,100	116,800
"	" 11-16"	16.14	152,800	151,100	149,400	129,120
"	" ¾"	17.70	167,600	165,700	163,900	141,600
2	3"×2"×5-16"	2.70	23,100	22,300	21,500	21,600
"	" ⅜"	3.32	28,500	27,600	26,600	26,560
"	" 7-16"	3.92	33,700	32,600	31,500	31,360
"	" ½"	4.54	39,200	37,900	36,700	36,320
2	3"×2½"×5-16"	3.28	28,900	28,100	27,300	26,240
"	" ⅜"	3.88	34,100	33,200	32,200	31,040
"	" 7-16"	4.56	40,100	39,000	37,900	36,480
"	" ½"	5.16	45,100	44,100	42,900	41,280
2	4"×3"×⅜"	5.10	46,900	46,000	45,000	41,280
"	" 7-16"	5.74	51,900	50,800	49,700	45,920
"	" ½"	6.48	58,600	57,300	56,100	51,840
"	" 9-16"	7.36	66,600	65,200	63,800	58,880
"	" ⅝"	8.08	73,000	71,400	69,900	64,640
2	3½"×3"×⅜"	4.36	38,900	37,900	37,000	34,880
"	" 7-16"	5.16	46,100	45,000	43,900	41,280
"	" ½"	5.98	53,600	52,300	51,100	47,840
"	" 9-16"	6.80	61,600	59,600	58,200	54,400
"	" ⅝"	7.62	08,400	66,800	65,300	60,960
2	4"×3½"×⅜"	5.26	47,900	47,000	46,000	42,080
"	" 7-16"	6.18	56,300	55,200	54,100	49,440
"	" ½"	7.20	65,800	64,500	63,300	57,600
"	" 9-16"	7.90	72,000	70,600	69,200	63,200
"	" ⅝"	8.76	79,800	78,200	76,700	70,080
2	4½"×3"×⅜"	5.20	47,300	46,400	45,400	41,600
"	" 7-16"	6.34	57,900	56,800	55,700	50,720
"	" ½"	7.24	66,200	64,900	63,700	57,920
"	" 9-16"	7.98	72,800	71,400	70,000	63,840
"	" ⅝"	8.86	80,900	79,200	77,700	70,880
2	5"×3½"×⅜"	6.08	56,100	55,200	54,300	48,640
"	" 7-16"	7.16	66,100	65,000	63,900	57,280
"	" ½"	8.22	76,000	74,700	73,500	65,760
"	" 9-16"	9.26	85,600	84,200	82,800	74,080
"	" ⅝"	10.44	95,600	94,000	92,500	82,720
2	6"×4"×½"	9.56	89,400	88,100	86,900	76,480
"	" 9-16"	10.68	99,800	98,400	97,000	85,440
"	" ⅝"	11.82	110,400	108,100	107,300	94,560
"	" 11-16"	12 90	120,400	118,700	117,000	103,200
"	" ¾"	14.10	131,600	129,700	127,900	112,800

floor beams, etc., to proportion in sending out bids, I felt the necessity of such a table a few months ago, and got up the one I herewith inclose. It has proved to be of inestimable value to me in quickly proportioning the flanges of plate girders, floor beams, iron stringers, the top and bottom chord of latticed girders or any riveted structures where it is necessary to compute the net sections of angles, deducting as customary 2 rivets. The table inclosed saves a great deal of time and avoids errors which are likely to be committed by the most accurate and conscientious calculator. The table is so arranged that it needs no explanation, and I trust that it will be of use to Mr. [J. D. F.,

C. E., and I beg of you, if you think it advisable, to publish it as it may be of great use to those in the profession who are concerned in bridge designing.

F. E. EILSHEMINS, C. E.

RAILROADING ON THE PACIFIC SLOPE, ETC.

BOSTON, May 23, 1882.

EDITOR ENGINEERING NEWS:

In the selected article, "Railroading on the Pacific Slope," in your last issue, some of the figures seem to be rather carelessly stated. Notice the following: "In two miles on the division above Emory there are no less than 600 trestles and bridges," or about 6 to 100 ft. on an average.

In the scheme for standard time, why would it not be well to denote all the hours by letters, to distinguish from local time, A being for midnight, M for noon, etc.?

The sections for angles J. D. F. will find in "Carnegie" and some other handbooks. The area in sq. in. is equal to one-tenth the weight of a yard of iron. For special forms the planimeter is a rapid means of finding the area.

"Builders' Quantities" are very convenient in estimating. Most of those given under that head in your last issue are somewhat in excess, as they should be. We should like to see more of such data given.

E. P. A.

CALCULATING "OVER-HAUL."

NEWBURGH, N. Y., May 24.

EDITOR ENGINEERING NEWS:

As a resident engineer I have been under different chief and division engineers, and find that no two ever calculate "*over-haul*" the same way. At present the specifications read as follows:

"Provided the '*average haul*' of the material so transported does not exceed one thousand (1,000') feet, and beyond that distance (¢-c.) per cubic yard per one hundred (100') feet will be allowed and paid for such *extra haul*."

I would like information concerning the question of calculating over-haul, and knowing of no other one more likely to quote authority than yourself, I have taken the liberty of writing to you asking for your assistance.

G. A. M.

[We will be pleased to publish the methods in use by such of our readers as will favor us with the same.—ED. ENGINEERING NEWS.]

ADJUSTMENT OF GRADES TO CURVES.

CHIEF ENGINEER'S OFFICE,
TIONESTA VALLEY RAILROAD,
SHEFFIELD, Pa., May 17, 1882.

EDITOR ENGINEERING NEWS:

In reviewing the good things in your valuable paper, as I make it a practice to do, I find a very interesting article on Adjustment of Grades to Curves, in Volume 9, No. 9.

I entirely agree with the gentleman from Glendive, as I also do with Hensenger von Waldegg, that the gauge has very little to do with curve resistance in standard as compared with other gauge of roads.

Many argue that the difference is as the squares of the gauge. I have ever failed to find it so. If my memory serves me right, I have found it to be about as follows:

The *relative* resistance due to *gauge* is *inversely* as the radius, minus *twice* the *gauge, squared*. For example, in a 4° curve on standard (4 ft. 8½ in.) gauge and narrow (3 ft.) gauge we should have the resistance *inversely* as (1432.69 ft.—9.42 ft.)² is to (1432.69 ft.—6 ft.)², which you will perceive is very little different.

When called to take charge of the above road my predecessor had made it a rule to use an "equation" of 0.05 of a foot to the degree for stations of 100 ft. This "equation" was a constant and applied to a 1° curve alike with a 20° curve, not being increased as the radius became shorter. In finishing up the work begunby him I of course used his "equation," though it was erroneous.

While I was employed by the Denver & Rio Grande Railway Company I received orders to use 0.04 of a foot to the degree, and afterward received new orders and instructed to use 0.05 per degree of total curvature for stations of 100 ft. length.

Several years ago I made some investigations on the resistance due to curvature and adjusting grades to curves to make resistance maximum on the tangents and equal on all degrees of curvature, that is, lessening grade on the curves. I found the resistance to be greater per degree as the radius became shorter, and compiled a table of "adjustments" from 1° to 20° of total curvature per station of 100 ft. My results do not agree with either of the tables given by Brother Glahn, although they may be nearer the truth than mine; yet I have noticed where I have used the following table that an engine was always able to take any train through to destination if it could start it on either curves or tangent on maximum grade. This in view, I think it may be safely used, and if of any use to fellow engineers, I shall feel doubly repaid for all the labor it has cost me in its computation

Per station of 100 ft.	Foot.	Per station of 100 ft.	Foot.	Per station of 100 ft.	Foot.
1°	0.039	8°	0.348	15°	0.772
2°	0 079	9°	0.400	16°	0.845
3°	0.130	10°	0.455	17°	0.922
4°	0.162	11°	0.513	18°	1.003
5°	0.206	12°	0.573	19°	1.089
6°	0.251	13°	0.636	20°	1.180
7°	0.298	14°	0.702		

F. F. WHITTEKIN,
Chief Engineer T. V. R. R.

THE NEW CORLISS ENGINE AND PUMP AT PETTACONSETT, PROVIDENCE, R. I.

This new engine, which was built for the Boston improved sewerage, but which the city of Boston would not accept, was sold to the city of Providence to replace the Cornish engine at the Pettaconsett pumping station of the Providence Waterworks. The price is $100,000, and the contract called for a pumping capacity of 7,000,000 gallons per 24 hours. The official trial of the machinery was commenced on the 22d, to be continued six days. The fly-wheel, 25 ft. in diameter, makes 36 revolutions per minute in pumping at the rate of 9,000,000 gallons, and at the trial the speed was run up to 50 revolutions per minute, at which water was pumped at the rate of 12,588,643 gallons per 24 hours.

The following is a

DESCRIPTION OF STATION AND ENGINE.

The pumping station is located on the banks of the Pawtuxet River, about 200 ft. from the Cornish engine house.

BUILDINGS.

The buildings are of brick with granite foundations. The engine is 38 ft. by 48 ft., outside, and 36 ft. high above grade. The windows are 17 ft. 10 in. high by 5 ft. 8 in. wide. The boiler house is of the same height as the engine room—80 ft. by 48 ft. 6 in., and the walls of both buildings are 2 ft. thick. The chimney is 85 ft. high above grade, having a flue 4 ft. square. As the grade is fixed at 16 ft. above ordinary high water in the Pawtuxet River, there is a basement 10 ft. 6 in. deep, lighted by two windows opening toward the river, which are provided with iron shutters for use in case of extraordinary freshet.

PUMP WELL.

The pump well is 15 ft. 6 in. by 17 ft. 6 in., and has a heavy floor of ribbed cast iron, the bottom of which is 2 ft. 6 in. below the bed of the river.

CONDUIT.

The pump well is connected with the river by a cast-iron conduit 25 ft. in length 5 ft. in width and 7 ft. in height, provided with a gate operated by hydraulic pressure. The outer end of the conduit is formed to receive a movable grating convenient of access and having bars one inch apart. From the bottom of the iron floor of the well up to the engine room floor is 24 ft. 10 in. From the same point to the ceiling of the room is 56 ft. 4 in., and to the top of the chimney 109 ft. 7½ in. The engine room is ceiled with wood, which forms a panel covering the entire space occupied by the machinery; the remaining portion of the ceiling and the side-walls are plastered with two coats of brown mortar, finished in soapstone of a gray tint. In the ceiling directly over the heavy parts of the machinery are located 10 eye-bolts, each capable of sustaining 15 tons weight.

STAIRCASES.

All parts of the building and the galleries for walking-beams are made accessible by iron staircases provided with hand-rails of polished brass.

EXCAVATIONS.

In clearing the ground and preparing for the foundations of this work more than 5,000 cubic yards of earth had to be removed to a distance of one-quarter of a mile. When the level of the river was reached a bed of quicksand was encountered, extending to a depth unknown. To insure the necessary solidity for sustaining the heavy weight to be held up by the foundations, recourse was had to the use of 1,394 wheelbarrow loads of cobblestones and 651 of gravel, driven into the sand by means of a spherical cast-iron hammer, 32 in. in diameter, weighing upward of 4,000 lbs, dropped from heights varying from 20 ft. to 40 ft. Four thousand three hundred and ten blows of this hammer were applied in preparing these foundations.

MATERIALS USED IN CONSTRUCTION.

541,022 bricks.
600 cords of building stone.
319 barrels of lime.
628 barrels cement.
110,000 lbs. iron (exclusive of machinery).
60,000 ft. hard pine and other lumber.

ENGINE.

The machinery consists of two beam engines, working on the compound principle, coupled together by a crank-shaft carrying a fly-wheel 25 ft. in diameter, weighing 31 tons.

The high-pressure cylinder, 18 in. in diameter, takes steam direct from the boilers, 125 pounds pressure, and exhausts into a receiver placed between the engines. The low-pressure cylinder, 36 in. in diameter, takes steam from the receiver and exhausts into the condenser. Both cylinders are steam jacketed, and have the same length of stroke, 6 ft.

The valve gear for both engines includes cut-off, variable at pleasure by hand, and also regulated by a governor, and embodies improvements in construction which were first brought out and exhibited on the "Centennial engine," at Philadelphia in 1876.

PUMPS.

The pumps, 4 in number, are of the plunger type, the plungers for which are each 19 in. in diameter and have 3 ft. stroke. Each pump chamber contains 100 valves, 96 for the suction and 96 for the delivery. The aggregate area of 96 valves is largely in excess of the area of a plunger.

BOILERS.

There are 4 boilers of the upright "Corliss" pattern, generally rated at 100 horse-power each; but when pumping at the rate of 10,500,000 gallons in 24 hours, only 3 of the boilers are used—although the power required is 375 horse-power (or 125 horse-power for each boiler.

SPECIFICATIONS.

There is no subject more important to contractors and constructors in every branch of business than that referring to specifications; and yet these latter are only too often regarded as dead letters by those for whose guidance they are supposed to be drawn. As an illustration of this we may say that it has come to our knowledge that managers of large iron works have, on the receipt of specifications, taken it for granted that there was nothing special in them.

The general fault in specifications is that conditions are imposed which are either illegal or impossible to be insisted upon, and in respect to the illegality, we would call attention to the power given (nominally) to an engineer or architect to decide disputes which really can only be determined in law courts, or in the Chancery Division of the Supreme Court of Judicature. Arbitration, as a rule, is unsatisfactory, as much may be suppressed before an arbitrator which would be given in evidence in the ordinary law courts.

A good instance of the crude way in which specifications are drawn may be found in the fact that a specification for a line of railway seldom includes instructions for the carrying out of oblique arches, this omission being probably due to the fact that such specifications are drawn by unlettered clerks instead of being properly prepared by competent engineers or architects. The results accruing from such work being entrusted to people of the class to which we have referred are not unfrequently sufficiently ridiculous. A really amusing instance of this came under our notice a few years since, where the specification for a line of railway on which all the bridges were built of *brick* was copied from that of a line on which the bridge abutments were constructed of *stone*, so that the specification contained several pages referring to the execution of rubble masonry, face dressing and Ashlar, and but five lines referring to brickwork, if required.

In clauses referring to ironwork special care should be taken to put no over stringent restrictions upon the contractor. In designing the ironwork the engineer should first ascertain the strength of the iron which will be used in the construction of his work, and this he can almost invariably do. In the construction of girders we have to regard not only the ultimate strength of the iron, but also its elasticity; very stiff wrought iron is not to be relied upon, on account of its liability to snap; in fact, iron of such a character is less reliable than cast iron.

Generally speaking, there is need for more care in the matter of specifications on both the architect's or engineer's part and the contractor's. The former, while so forming his clauses as to leave no loophole for "scamping," should take care not to be over harsh. Some specifications we have seen which no contractor in his senses would think of attempting to work to. Others again, like the one mentioned above, have been so slipshod in their language and general bearing as to permit of almost any construction being put upon them. These latter are fruitful causes of lawsuits, and encourage that bane of the contract system, the "scamper," than whom we know no one more objectionable. A happy medium between these two extremes is what is wanted, with a due attention to any exceptional features that the work may happen to present.

It would be impossible to deal with such a many-headed question as this in a few short lines; we merely wish to keep the subject before our readers, pointing out from time to time, as opportunity occurs, anything that may be obviously wrong. We would take occasion to again remark that this matter will never receive the united attention which it ought until we have a central society of contractors, where questions of this kind can be dealt with by contractors as a body. When we have such a society, then we shall be within a measurable distance of well-drawn and equitable specifications.—*London Contract Journal, May* 10.

THE KEELY MOTOR SUIT.

PHILADELPHIA, May 24.—John W. Keely to-day filed his answer to the equity suit against him by the stockholders of the Keely Motor Company. The answer, which is sworn to, substantially admits the truth of the formal portions of the complainant's bill concerning the contract, etc. Keely adds that although, owing to certain abstruse difficulties by reason of the nature and qualities of the said force, he has thus far failed in his efforts to bring the said inventions and discoveries into any practicable use, or to arrive at the utility required by the law, he believes he will ultimately succeed.

ENGINEERING NEWS

AND

AMERICAN CONTRACT JOURNAL.

GEO. H. FROST.....PROPRIETOR.

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S. D. V. BURR. .....ASSOCIATE EDITOR.

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Articles for Publication in the current number should be received at the office of publication not later than Thursday morning, and advertisements not later than Friday noon.

Correspondence upon subjects which naturally belongs to the province of this journal is solicited.

CONTENTS.

	Page.		Page.
Engineers and Engineering in Other Lands (*Illustrated*)	167	EDITORIAL DEPARTMENT: Notes	170
CORRESPONDENCE: Tide Breakers	168	New Publications	170
Replacing Chord Bars	168	Secondary Batteries	171
Table for Angles in Plate Girders	168	The Panama Canal	171
Railroading on the Pacific Slope	169	Out of Print	171
Calculating Overhaul	169	Personal	172
Adjustment of Grades to Curves	169	Saratoga, Mt. McGregor & Lake George Railroad	172
The New Corliss Engine and Pump at Pettaconsett, Providence, R. I.	169	The History and Statistics of American Water-Works	172
Specifications	169	Frauds in Philadelphia	173
The Keely Motor Suit	169	Engineers' Club of Philadelphia	173
		General Intelligence	173

THE MISSISSIPPI JETTIES.—Admiral Daniel Ammen, U. S. N., in the N. Y. *Herald* of the 22d, criticises the condition of the jetties and predicts the closing of the South Pass by the accumulating deposits being carried to the sea end of the jetties and there forming a bar.

EMPLOYER AND EMPLOYÉ.—Employers in many of the large cities are forming unions to resist the demands of the trade and labor leagues. It is to be regretted that two interests, mutually dependent upon each other, and of vital importance to not only their immediate section but to the whole country, should be compelled to unite their forces in order to successfully combat each other. It requires no gift of prophesy to foretell which will yield first, the union of laborers with no money, or the union of capitalists with practically unlimited wealth and boundless resources.

NEW PUBLICATIONS.

Report of LIEUT.-COL. HENRY L. ABBOTT, U. S. Engineers, upon Submarine Mines for the Defense of Harbors of the U. S. Professional Papers, Corps of Engineers, U. S. A.

A large quarto, under the above title, has issued from the Government press, at Washington, D. C., with illustrations of the various apparatus used, and effects produced, in experimenting with torpedoes at the Government Station, Willett's Point, East River. The work is divided into three chapters. The first, on the effects of explosions of torpedoes with varying charges of different explosive compounds, is interesting as descriptive of the phenomena attending subaqueous explosions, and which are so rarely to be witnessed on a large scale as to render these descriptions, embracing experiments as conducted in Europe on full-sized ships, as well as the explosions in the East River channel, commencing in 1869 at Willett's Point, and continuing until the present time, with illustrations, of great professional interest; but aside from the curious anomalies attending these explosions, as witnessed from the shore, which are seized on the instant by a number of cameras arranged to receive their impressions at intervals of fractions of seconds, the one from the other, and so giving, as it were, a moving picture of the explosive effects, the subject is without much practical interest to the civilian, as not likely to come within the field of his own operations.

A very simple expression, as the result of the experiments, has been arrived at for the extreme destructive range of torpedo effects against shipping in varying depths of water, upon the supposition that dynamite No. 1 (which explosive compound has been selected from a large number as giving the best results for this service) is used. By the following formula it is computed that if a vessel of war of the first class lies at or within the distance $\triangle$ she will be destroyed; if beyond that distance she will escape rupture of the hull:

$$\triangle = \sqrt[2.1]{\frac{(\delta + \varepsilon)c}{8}}$$

c. Weight of dynamite in pounds.

ε. Constant derived from experiment.

$\triangle$. Distance in feet from object.

δ. The angle with the vertical passing through the centre of the charge made by a line drawn from that point to the surface exposed to shock, reckoned from the nadir in degrees. The submergence being not less than 3 or 4 ft. for each 100 lbs. weight of charge.

We quote, in reference to this formula: "Upon the supposition that the strength of the hulls of ships of war should be increased, a corresponding change in the constant 8 would indicate the new requirement. Suppose that some new explosive compound should prove to be better suited to the work than dynamite No. 1, a new value for the constant ε is all that becomes necessary. It will, therefore, be comparatively easy hereafter to keep pace with modern progress, but it must not be forgotten that there will be need of constant vigilance and of systematic research."

Chapters No. 2 and 3, on the contrary, while treating of the various forms of electrical progress, and apparatus for igniting the charge, having reference to their uses in connection with the torpedo service mainly, are of value to the civil engineer as applicable also to submarine blasting or excavation of any kind, where indeed this form of fuse and igniting apparatus are alone to be relied upon, while the torpedo service under any emergency will probably be left to the highly trained special government officers. Submarine mining and excavations, such as opening the channel at Hell Gate and similar undertakings, will properly fall under the head of Civil Construction, and the substance of these two chapters become of equal interest to the civil as to the military engineer, and a sketch of their contents will be of interest.

Chapter II. treats exclusively of the various forms of electrical fuses. This is the delicate point involved in submarine blasting, and samples of every variety of fuse obtainable in this country or in Europe have been experimented upon, the laws of their ignition analyzed, and the resulting formulæ experimentally verified. It will be recollected that whatever may be the charge used in submarine blasting, whether it be a torpedo which may remain for months under water before being called into use, or a submerged tunnel through rock, the fuse by means of which the charge is to be exploded, and which must be in contact with it, must be equally preserved against deterioration by moisture or any other means whereby its sensitiveness to action by an electrical current can be impaired. All these forms of fuses are based upon the property possessed by a Voltaic current of heating any poor conductor introduced into the circuit. Every electrical fuse should have: *First*, two insulated conductors for conveying the current. *Second*, a plug to receive and firmly hold an end of each near to but not touching the other. *Third*, a small priming suitably arranged for ignition at this point, and *Fourth*, a metallic cap containing a detonating charge, usually of fulminating mercury. The result of most extended experiments at Willett's Point in reference to this subject is thus stated:

"The low tension variety of fuse is used with strong electrical currents of low potential; the high tension variety with condensed sparks capable of jumping a sensible air space; and the medium tension, especially designed for magneto-electric machines, which generate electricity characterized by a potential higher than the former and less than the latter. It does not follow, however, that a given variety of fuse can only be ignited by a particular kind of electrical generator; but as a rule, each of the three classes of generators should be provided with a fuse specially adapted to it. The conditions common to all fuses, however, are stated as follows:

"1. The insulated conductors should be tough and of low electrical resistance. Lake Superior copper wire, No. 20, B. W. G., of two unequal lengths (5 and 7 in.) have been adopted. The insulation must be proof against deterioration from age, a condition which excludes gutta percha and india rubber; it is well fulfilled by a closely woven wrapping of cotton thread coated with paraffine, or with beeswax, resin and tar boiled together; the free ends bared for about 1½ in."

"II. The plug must be a non-conductor of electricity, not liable to detoriate with time and exposure to damp air, nor to corrode the copper wires. Beech wood, kiln dried and coated thickly on the outside with Japan wax, well fulfills these conditions. The shape must be such as to render any contact between the wires impossible, and to clamp them so firmly that no accidental strain on the free ends can disturb their internal adjustment. The following form is used, and may be understood without a diagram:

"The plug consists of three parts. 1st, a cylinder, ¼ in. in diameter and 0.7 in. long, grooved longitudinally on its opposite sides to secure the wires. Entirely round the middle is a cut, .05 in. deep and .15 in. wide. The wires with their wrapping of cotton are each pressed into one-half of the longitudinal grooves until they reach the cut; they are then both bent sharply to the left, nearly at right angles, and are led through this cut until they have passed half round the cylinder, when they are again bent at right angles and pressed into the other half of the longitudinal grooves. Then each wire leaves the plug in the opposite groove from which it entered, and at no point can they come in contact with each other. The inside ends of the wire are then bared, scraped, cut to the proper length (about .1 of an inch), and prepared according to the class to which the fuse belongs. 2d, of a hollow cylindrical cap with a stout shoulder at one end having a smaller hole for the passage of the free ends of the insulated wires. This cap is made to closely fit the solid cylinder, and the latter smeared with glue is forced into it until the end abuts against the shoulder having a small chamber round the bridge (by this term the short thin metallic connection between the wires in the low tension fuse is meant) to receive the priming. 3d, of a paper disk held in position by a drop of collodion, to close the latter. These several parts are turned by machinery to fit each other accurately, and forms a solid, strong and perfect protection to the bridge and priming.

"III. The detonating cap is made by punching a disk of stout sheet copper into a cylindrical form fitting the plug closely. The bottom is solid and contains 20 grains of fulminating mercury, held in place by a paper disk secured by a drop of collodion. This charge, which, added to the priming amounts to about 24 grains, is found by experiment to be amply sufficient to detonate dynamite in loose powder, either soft or frozen. The cap is 1 in. long and 0.4 in. in diameter, and entirely encases the chamber of the plug, and secured to it, by indenting it by pressure near the top into the wood. The fuse thus formed is 1¼ in. long and 0.4 in. in diameter, and when completed is dipped into melted Japan wax, giving a waterproof coating to the whole."

The different kinds of fuses, as also the metal used for conducting the electricity between the insulated wires, and its dimensions, as also the waterproof material, and every part and parcel of which the fuse is made, or of which its filling is composed, has been the subject of extended experiments and investigations before determining the proportions of ingredients, and provision is made for determining by actual tests in all cases in advance the character of the fuse and its certainty of action and its sensitiveness, and all these points are put into practical shape by formulæ ex

pressive of the condition under which given results may be anticipated.

To illustrate the necessity of this in the case of the ignition of high tension and medium tension fuses. On one occasion at Willett's Point fifty of these fuses, connected in series, were hung upon nails driven in the sides of a wooden shed, and the induction of an ordinary thunder-cloud caused the explosion of *five* of them—every fuse which touched a nail. An ebonite comb passed a few times through the hair of a child holding one of the terminal wires, the other being insulated in the air, generates a current sufficient to fire the priming.

The experiments which are given in detail in the appendices, specifying the character of the fuse as well as the charge, and the apparatus for ignition, whether frictional, dynamo-electric, or voltaic, the principles of which, and the relative advantages, are all sufficiently enlarged upon, altogether form a mine of information to the civil engineer engaged in submarine blasting, and the extent of which can scarcely be realized unless by consulting the pages of this Report, together with the Torpedo Musuem at Willett's Point, which we infer is open to such examination. This inference rests upon the fact that much of Gen. Abbott's labor has been devoted to investigations and experiments which are for obvious reasons witheld from the public; but what is given in this Report and its reference to the musuem of apparatus at Willett's Point has been published with a view to the dissemination of information of value to the public interests in prosecuting our great internal improvements, and which can be sought for to advantage at no other source.

SECONDARY BATTERIES.

At the beginning of the present century it was known that the wires from a pile, the current of which had been used to decompose water, possessed the peculiar property, after having been detached, of giving off an electric current, considerable in power, but brief in duration, and which early received the name of "secondary current." These currents became the special study of the French physicist, M. Gaston Planté, and in 1859 he began a thorough investigation into the effects produced by voltameters of different metals and different excitants. As a result of his labors he found that lead plates immersed in dilute sulphuric acid would yield a greater amount of dynamical electricity than any other combination. Here we have the more important steps leading to the secondary battery, or, as it is sometimes called, the accumulating or storing battery, and upon which is now directed the combined energy of the scientific world.

The secondary battery of M. Planté, as constructed by him in 1860, consisted of two broad and long strips of sheet lead, placed one upon the other, with an intervening layer of coarse cloth, and then rolled into a spiral. From each sheet projected a thin strip to form the electrodes. The roll thus formed was placed in a jar filled with acidulated water in the proportion of one part sulphuric acid to ten parts water, and as this ratio has been used in all the batteries hereafter described we will not mention the parts again. The cloth in this arrangement was a great disadvantage, as it had no endurance when placed in the acid, and as it presented an additional interior resistance; as an improvement the plates of lead were placed parallel to each other and kept apart by rods, the whole being set in a rectangular vessel and presenting the appearance of a zinc-copper battery, as constructed a long time ago. This, although giving quite good results, was not satisfactory for continued use, as the chemical decomposition resulting on the lead surfaces had a tendency to warp them and thus produce unexpected contacts, destroying the efficiency of the apparatus.

The Planté battery as now made is formed of two sheets of lead rolled upon each other, and separated by narrow India rubber strips, which have the advantage of remaining unaffected by the acid. When being constructed the plates of lead are placed one upon the other, the separating strips between, and the whole rolled upon a small cylinder of either metal or wood. In order to insure a permanent insulation it would be well to lay two of the strips near and parallel to the edges that will form the end of the roll, and two strips transversely. The electrodes are placed at opposite sides of each strip, so that when finished one projects from the center of the roll and the other from circumference. We now come to the most important operation connected with the construction of this battery, namely, the formation.

An electric current from a Bunsen or other battery, or if possible from a dynamo machine producing currents in the same direction, is made to pass through the element. A decomposition depending in rapidity upon the strength of the current is commenced, oxygen being liberated at one plate and hydrogen from the other. If the exciting current be detached and the two sheets connected, a current (called secondary) will be produced. This action is owing to the presence of the oxygen, which leaves its own plate and attacks and oxidizes the other; and from this it will be readily perceived that the strength and duration of the battery depends upon the superficial area of the plates and of the power and period in action of the primary current. In order to prepare the cell for the reception, or accumulation as it is generally termed, of electricity, the course of the current is now changed, when the chemical actions occur at the opposite plates, and in course of time the surfaces are altered, one being covered with a spongy mass of reduced lead, and the other with peroxide of lead, when the cell is complete and ready for electrical accumulation. In order to permit of crystallization, a delay of five or six days is allowed between the changing of the currents. The capacity or power of the battery depends upon the amount of peroxide of lead to be reduced and the amount of lead to be oxidized. Of course the deeper the charge is made to enter the sheets the greater will be the final result, and consequently the first current should be powerful.

FAURE.

M. Faure reasoned that if the chemical changes which take place in the Planté battery could be produced by mechanical means, the ultimate strength would be increased, and the time required for making, and therefore the cost, would be most materially lessened. He also added some further improvements tending to increase the actual surface exposed to action without adding much to the size of the plates.

In constructing a cell after his plan a sheet of lead is cut the required size and perforated with a number of holes. A layer of red lead, mixed with water, slightly acidulated with sulphuric acid, is spread evenly over this plate; first one side being prepared and covered with a protecting sheet of parchment, and then the other. A cloth sack is now placed around the plate so as to completely encompass it, with the exception of one corner, which forms an electrode. The positive and negative plates are constructed in the same manner. The plates are then arranged, parallel to each other, in a box, and the exposed corners of alternate plates connected, so that there are but two electrodes—positive and negative—leading from each cell. Acidulated water, same as in the Planté, is now poured into the box until the plates are submerged about half of an inch. The cell is now completed, so far as its mechanical construction is concerned.

Several cells are placed in the same circuit of a powerful dynamo machine—not alternating—and left until the red lead on the positive* element has been converted into peroxide of lead, and the red lead on the other element into a spongy mass of reduced lead. The battery when ready for use may be charged with electricity, after which it is used in the same manner as the ordinary galvanic battery.

Two weeks since the steamship Labrador arrived at this port from France with several of the Faure batteries on board which had been used during the entire voyage to light the vessel. From a report published in one of the New York papers, and purporting to come from the engineer who had charge during the voyage, we learn that "A Faure battery will last about 400 hours, delivering one weber per hour of current, with an electro motive force of two volts. It thus requires two secondary piles to run an Edison lamp, but these two piles will run such a lamp steadily 400 hours without replenishing the charge."

* Which is the positive element is determined by the direction of the current from the dynamo.

THE PANAMA CANAL.

Ever since the inception of this project the items purporting to be of a reliable character have been tinged with the local bias of the papers publishing them, or with the personal interests of the individuals giving them. To a large extent the western slope is interested in the success of the project, inasmuch as it might enable shippers to enter into more close competition with the railroads, and as a consequence we receive glowing accounts and descriptions of the progress of the work. Dispatches from "the seat of war" vary according to the political feelings of the sender. The English and French papers publish such information as M. De Lesseps sees fit to give them.

The New York *Tribune* publishes an interview between its Paris correspondent and M. Le Lesseps. This states that on the 20th ult. Messrs. Hume, Slaven & Co., of San Francisco, signed a contract to excavate 6,000,000 cubic meters at the Atlantic end of the canal, work to commence within six months after the signing. The great projector is reported as saying: "We are pushing things, and we have good reason to hope that the great work will be completed in 1888 or 1889, for the difficulties were not so great as were anticipated." Three hundred millions of francs of stock is held by Frenchmen, and it is quoted (by M. De Lesseps) as being 40 francs above par. Illustrating again the adage about crows, and which crow was deepest dyed, M. De Lesseps has a few words to say regarding the projected routes, as follows:

"The Eads ship railroad is before the public. Capt. Eads is a great engineer, and I have the highest respect for his opinion on subjects which pertain to engineering; but when it comes to sending ships across the isthmus by leaving them in their natural element or by carrying them over in mid-air, I think I am correct in saying that the vast majority of ship-owners will prefer the former method. The Nicaraugua canal, the Eads railroad, et al., will, if they are ever made, only be of advantage to my canal, for commerce will always prefer to keep ships in the open water to sending them up in the air or hampering them with locks. I admire Admiral Ammen, but I don't take his stocks." Here we have a statement purporting to come direct from the most interested party, and it presents a most encouraging outlook for the undertaking.

OUT OF PRINT.

"Latham's Sanitary Engineering," American edition, is *out of print*, and no more orders for the cheap copy will be taken. On the strength of our advertisement, lately published, *every copy was sold*, and unless we can pick up a stray copy here and there, we can fill no further orders at less than $12, for which we will send the English edition. We cannot even fill an order for the $3 copy. We regret having been obliged to return the money for a number of copies sold this week, but it was unavoidable.

This book, the first of any importance and the most complete as yet that has been published on the subject of sewerage, has fulfilled a good purpose. The price of the English edition amounted to almost a practical prohibition of its extensive introduction into the libraries of American engineers, who could ill afford to spend from their small salaries so large a sum for a single volume. Our publication of it therefore as a supplement to ENGINEERING NEWS without extra charge was re-

ceived with universal approval by our readers, and it gave to our subscription list a very satisfactory increase, an increase which thereafter became permanent. What the benefits arising from the distribution of several thousand copies of such a book may be we leave for our readers to infer from their personal experience.

Another notable book which we published, "Humber's Water Supply," is also out of print, and we have sold every copy but one unbound one, now in our possession, but which is also for sale at $12. This reprint is, we claim, the largest undertaking in scientific book publishing in the history of the trade in America. A $60 book was reproduced, full size and almost equal in every respect to the original English work, and placed on the market at $10 per copy. Van Nostrand has a few copies of the bound volume remaining unsold, the price of which is $20. When these are disposed of the price will go back to original figures, or nearly so.

We are now offering such numbers of the well-known Weale's Series as are on our shelves at *half price* for a short time only, as when the sale becomes slow we will sell the balance of the stock to the second-hand book dealers at the best attainable prices. We have also the remaining copies of Greene's Bridge Trusses, published in 1877, and which was one of the most popular and best selling books on the subject of bridges ever published. We offer it at 60 *cents*, post-paid to any address. The price of the new edition is $2.50. The 60-cent book is the best in bridge literature that can be bought anywhere to-day at the price. The Annales des Ponts et Chausées, bound in 4 vols., for 1878, for $5; for 1880, complete but unbound, $3; for 1881, less Nos. 9 and 11, for $2. The subscription price in Paris is 33 francs. A set of the Transactions of American Institute of Mining Engineers, 1874 to 1881, 7 vols., complete and bound in stiff paper, uncut, is for sale at $3 per volume; Journal of Franklin Institute, 1867 to 1872, 5½ years, or 11 vols., elegantly bound, for $20; for 1876 and 1877, complete in 2 vols., at $2.50 each. There probably will not soon be as favorable opportunities for buying these valuable books at the same low figures, and therefore we call attention to them.

PERSONAL.

THE death of Mr. J. S. Symons, Grand Trunk Engineering Department, is announced.

MR. F. PHILLIPS has been appointed Chief Engineer of the Cincinnati, Columbus & Hocking Valley Railroad.

MR. JOHN LAMONT, formerly of Boston, has left Texas for the City of Mexico, where he will hold an important railroad appointment.

C. A. CLINTON is Chief Engineer of the Kansas City, Springfield & Memphis Railroad Company, with headquarters at Springfield, Mo.

J. C. JAMES, chief engineer of the Chicago & Grand Trunk, is appointed chief engineer of the Canadian Pacific, and will have charge of construction.

MR. JOSEPH W. COBURN, who stood beside LAFAYETTE at the laying of the corner-stone of Bunker Hill Monument, is the oldest master-builder in Boston.

COL. J. W. ANDREWS, late Assistant Superintendent, has been appointed Chief Engineer and General Superintendent of the Midland North Carolina, in place of Major J. B. YATES, resigned.

S. P. WOLVERTON, of Sunbury, is President; ANDREW H. DILL, Treasurer, and WM. LORENZ, of the Philadelphia & Reading, Chief Engineer of the Shamokin, Sunbury & Lewisburg Railroad.

THE new excavations at the Forum and Pantheon were thrown open for the first time on the 2,685th birthday of Rome, when Humbert and Margherita visited them, the ruins being illuminated with Bengal lights.

CHIEF-ENGINEER GEORGE W. MELVILLE, who has been searching for the missing boat and party of the Jeanette, has bright blue eyes, fair skin, weighs one hundred and ninety, is a skilled athlete, and belongs to an old Knickerbocker family.

W. B. SHUTE, the widely-known railway contractor, of Milwaukee, and Vice-President of the Wells & French Company, bridge and car-builders, of Chicago, died suddenly of paralysis, in Sioux Rapids, May 16. Mr. Shute was a member of the railway contracting firm of Wells, Harrison & Shute.

SUIT FOR SLANDER.—JOHN S. BOGART has sued THOMAS MCCANN, the Brooklyn contractor, for $10,000 damages for slander. The complainant says that about the 21st of February, 1882, the defendant accused him of dishonest and corrupt transactions while in the employ of the city of Brooklyn.

A HISTORIC HOUSE in Boston, which has had but one tenant, was never darkened by death nor gladdened by the birth of a child, the home of WENDELL PHILLIPS for over forty years, before which Dom PEDRO, KALAKAUA, and the Prince of Wales took off their hats as they drove by, is to be demolished on account of the extension of an avenue.

MISSING.—From the *Railroad Gazette* of May 26 we take the following item: Mr. J. C. GREGG, an old civil engineer, who, when last heard from, was engaged on the Texas and Western Railroad at Beaumont, Tex., has not been heard from since Feb. 22. Information concerning him will be gladly received by his friends, and may be sent to the *Railroad Gazette* office.

WILLIAM B. BRYAN, for four or five years Borough Engineer of Blackburn, Eng., has resigned that position to accept the appointment of Chief Engineer of the East London Water-works Company, at a salary of £1,150 per annum. He stipulated that he should be allowed to superintend the completion of the Blackburn Waterworks scheme, to which he has been devoting attention since its commencement. His present salary is £750.

M. B. COWDEN, who for ten years has been City Surveyor for Harrisburg, Pa., was accidentally shot on an island opposite that city on the 20th. A gun club, to which he belonged, had been shooting at glass balls, and near the conclusion of the sport, a gun in the hands of one of the party was discharged within three feet of Cowden, the entire load entering his back under the shoulder. About six weeks ago the Assistant City Surveyor fell dead in the presence of Cowden.

GEN ROSSER appeared before the police court at Winnepeg on the 10th on information sworn out by S. R. Reed, of Joliet, Ill., late Chief Engineer of the company, to the effect that he, Rosser, did on the 28th of February obtain possession of the profile of a part of the preliminary surveyed line of the Canadian Pacific Railway from the junction of the Red Deer and Saskatchewan rivers to within fifteen miles of Fort Calgary, and carried away and still retains the same. After the examination of Duncan Shaw, from whom the document was taken away, the court adjourned.

R. HERING, the well-known sanitary engineer, of Philadelphia, has been quite ill for a week at Cleveland, to which city he was recently called to advise in sewerage matters. He is now in Racine, Wis., in consultation over the sewerage of that city. Mr. Hering's recent reports to the city of Philadelphia and the National Board of Health on the sewerage of European cities have met with a wide and unqualified approval, and the careful study and conscientious work bestowed upon them by Mr. Hering has added to the literature of the subject information of incalculable value. We are pleased to know that Mr. Hering's talents as a sanitary engineer of the first rank are being widely appreciated by the urgent demand for his services.

IT is curious that a tunnel between Calais and Dover was an engineering dream of the last century. In Sir JOHN SINCLAIR'S correspondence is given an account of a journey he made from London to Paris in 1789, in company with the elder Montgolfier, when upon arriving at Dover they discussed the *pros* and *cons* of a submarine tunnel. They proposed to ventilate it by barrels of compressed air let out in its center. A recent suggestion, curiously enough, was also made at that time:

> "And if the French should come—a rare oh!
> We'll drown 'em as the Jews did Pharaoh."

"The Bubbles of 1825" alludes to the same "happy dispatch"—

> "A tunnel underneath the sea from Calais straight to Dover, sir,
> With sluices made to drown the French, if ever they come over, sir."

"WHO KNOWS?"—It is said in England that the following is the true story of COUNT DE LESSEP'S second courtship and marriage; but perhaps it is and perhaps it is not: His first wife died when he was 68, and a few years later, the story goes, he became a frequent visitor in a family where there were five sisters. One day he remarked that the Arabs had expressed surprise that he could live without a wife, when one of the sisters innocently asked him why he did not marry then, to which he replied, "Because I am too old. He might fall in love with a young girl, but not she with him." "Who knows?" she said in reply. Some days after this he gave the lady a rose of Jericho, telling her how, after being dried, if placed in water it would burst out into bloom again. She took it, and when he next called brought it back to him, saying, "See what a miracle the water has effected upon the rose; it is the blossoming of love in old age." He met her eyes, and believing there was meaning in what she had said, proposed to her then and there, and was accepted. "But for this marriage," adds the chronicler, "it is very uncertain whether DE LESSEPS would have undertaken his laborious task at Panama. She is always at his side, and has been his chief help and support throughout his arduous conflicts with politicians, money-lenders, engineers and laborers."

SARATOTGA, M. McGREGOR & LAKE GEORGE RAILROAD.

Length, 10½ miles, from Saratoga Springs to Mt. McGregor, a spur of the Adirondacks. Grading was begun March 17, and is now near completion. Tracklaying is under way and will be completed as fast as trestling is out of the way, of which there is a considerable amount. It is expected to finish tracklaying by June 15, and to open for traffic July 1st. From the foot of the mountain to the top there is a sustained grade (compensated for curvature) of 4 ft. to the 100 or 211 ft. to the mile. Sharpest curvature, 24°.

The company have secured a tract of 1,000 acres on the mountain of an average level of 800 ft. above the springs and the country around; contains 2 fine lakes, and it is intended to make a park of it as an attractive summer resort, on account of the mountain climate and fine views.

H. K. Porter & Co., of Pittsburg, Pa., supply the engines, and Jones & Co., of Schenectady, the cars. The road is being constructed under the personal supervision of John McGee, Engineer and Superintendent.

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.

BY J. JAMES R. CROES, M. AM. SOC. C. E.

Continued from page 158.

CCCXI.—ATTLEBOROUGH.

Attleborough, Massachusetts, in lat. 41° 55' N., long. 71° 22' W., is on Mill River. It was settled in 1696.

In 1873 water-works were built by the town, taking the supply from a well near the river, with three pipes driven in its bottom to a water-bearing stratum and forming flowing wells. Connection is also made with the river for use when fires cause an excessive drought. The water is pumped by a Blake pump, supplemented for service by a Worthington pump, into a plate-iron tank lined with brick laid in cement, and holding 215,000 gallons at about 60 ft. above the town. In case of fire the water is pumped directly into the mains with from 80 to 100 lbs. pressure.

Distribution is by wrought-iron and cement pipe of 8, 6, and 4-in. diameter. There are 5½ miles in use, with 73 fire hydrants, 40 gates and 350 taps and 97 meters. The town contributes $1,500

yearly to the support of the works. Service pipes are of wrought iron, cement lined.

The population in 1880 was 11,111. The consumption is not stated. The works have cost $82,000 to the present time and the receipts have been $33,314. There is a bonded debt of $61,000 at 7 per cent. interest.

For the year ending May 1, 1879, the expenses for maintenance were $2,764.08 and the receipts from water rates $3,096.42.

The works are managed by a prudential committee of the water supply district.

CCCXII.—CONNERSVILLE.

Connersville, Indiana, in lat. 39° 40' N., long. 85° 8' W., is on the west fork of Whitewater River, on the bottom lands northwest of the river, back of which the bluff rises to a height of 96 ft.

Settled in 1814, it was incorporated as a city in 1869, in which year water-works were built for the city by the Holly Manufacturing Company, taking the supply from the old White Water Valley canal, which passes through the town and has for some years been used ony to furnish water-power.

The water is pumped directly into the mains by a Holly pump driven by water-power, giving an ordinary pressure of 50 lbs. and fire pressure of 80 lbs.

Distribution is by 3 miles of cast-iron pipe of 8, 6, and 4-in. diameter, with 65 fire hydrants and 175 taps. Lead service pipes are used.

The population in 1880 was 3,226. The consumption is not known. The works cost originally $10,000. No account is kept of the expenses. The receipts for 1880-1 were $1,200 and for 1881-2 were $1,000, the falling off being due to the withdrawal of two railroads.

The works are managed by three trustees elected by popular vote, one retiring every year. One-half the receipts from water rents and an additional sum of $550 raised by taxation go each year to the owners of the water-power, who operate the pumps.

John Verden is the Superintendent, and Anthony Watt, Clerk of the Board.

CCCXIII.—ELYRIA.

Elyria, Ohio, in lat. 41° 28' N., long. 83° 9' W., is on Black River, on level ground.

It was settled in 1815, and, in 1879, water-works were built for a private company by M. S. Frost & Son, after plans of Joseph Flannery, taking the supply from the Black River, across which a stone dam, 4 ft. high and 85 ft. long, forms a basin, from which the water is passed through a stone-walled filter-bed, of 4 ft. of sand, to the pump. A Worthington pump, of 1,000,000 gallons daily capacity, raises the water 100 ft., into a plate-iron tank, 34 ft. in diameter and 20 ft. deep, set on a stone-masonry tower, 80 ft. high, the wall of which is 4½ ft. thick at bottom and 2½ ft. at top. The tank is 75 ft. higher than the city. Distribution is by 8 miles of cast iron pipe, with 50 fire hydrants, 10 gates, 175 taps and 2 meters.

The town pays $60 each per year for fire hydrants.

Service pipes are of galvanized iron.

The population in 1880 was 4,500, and the daily consumption, 300,000 gallons.

No financial statements are furnished.

F. R. Persons is Secretary, Treasurer and Manager of the company.

CCCXIV.—FRANKFORT, KY.

Frankfort, Kentucky, in lat. 38° 12'N. long. 84° 54' W. on the Kentucky River, is on an elevated plain between the river and a bluff which rises to a height of 150 ft. The river flows in a deep channel of limestone rock.

It was incorporated in 1786. Water-works were built by the town in 1841, after the plans of Jaines Judge (?) taking the supply from a spring 2½ miles from the town, to which the water is conveyed in a 6-in. cast-iron pipe. The spring is 33 ft. above the town. A dam of stone was built three-quarters of a mile from the spring to make a stoarge reservoir for the waste water of the spring in the wet season, and a 12-in. pipe laid from it to the town. The stone dam, 200 ft. long, 35 ft. high, 10 ft. wide at bottom and 3 ft. at top, has never held water enough to make this reservoir available, and the pipe was so poorly laid that it has never been used.

The water of a spring is led to a reservoir 30× 80 ft. and 6 ft. deep, built of stone masonry.

Distribution is by cast-iron pipe of 4 and 3-in. diameter.

There are no fire hydrants, 8 gates and 500 taps. Service pipes are of lead and iron.

The population in 1880 was 6,979. The consumption is not known, and no financial statistics are given.

B. F. Meek is chairman of the Water Committee, and Samuel J. Shea the Superintendent.

[TO BE CONTINUED.]

ACKNOWLEDGMENTS.—The receipt of statistics, as follows, is acknowledged with thanks: From Anthony Watt, clerk of water-works trustees, statistics and water rates of the water-works of Connersville, Ind. From the Prudential Committee, statistics and water rates of Attleborough, Mass. From F. R. Persons, Secretary, statistics of the water-works of Elyria, O. From Samuel J. Shea, Superintendent, statistics and water rates of the water-works of Frankfort, Ky.

CORRECTION.—May 20, 1882, p. 158.—*Downingtown.*—Last line, for James B. Sirves, read *James B. Simes.* May 13, p. 156.—*Virginia City.*—There are 11 miles of distribution pipe (not 25) and 2,000 taps.

FRAUDS IN PHILADELPHIA.

PHILADELPHIA, May 22.—The sub-committee of the Water Committee of Councils, appointed about a month ago to investigate the charge that only $300 worth of brick-work had been performed at the Belmont Water-works, for which services the city was charged $1,800, met this afternoon. Chairman Bains, of the sub-committee, submitted a report which stated that the committee had appointed measurers who were instructed to investigate certain brick-laying work reported as having been done at the Belmont Works during January, February, March and April of the current year. This committee reported as a result of its measurement that the work for which the city had been charged $1,848.25 really cost only $770.64, an excess against the city of $1,077.61.

As a result of the above investigation and report, the following was submitted to councils on the 23d:

"*Whereas*, Dr. William H. McFadden, Chief Engineer of the water-works, has by the mismanagement of his department shown a conspicuous want of the ability, care and efficiency requisite to the proper administration thereof; therefor, be it

"*Resolved*, by the joint committee on water-works, that the said William H. McFadden be and he is hereby respectfully requested to resign his position as Chief Engineer of the water-works."

* * * * *

"I have not been asked to speak," said Dr. McFadden. "I have had no opportunity to defend myself. The workmen desire to be heard. I have no interest in their testimony. When I come before a proper tribunal I will a tale unfold of which gentlemen here little dream. For nine years I have been hounded and abused. Why? Because I have suffered no man to control me; because I broke up the East Park Reservoir ring; because I exposed fraudulent claims against the city, and because I sent Water Department thieves to the Penitentiary. My authority is not commensurate with my responsibility. I must depend upon subordinates, and am not permitted to appoint them myself."

Dr. McFadden is to be heard on Monday next.

LOOKING INTO THE STARR PIPE CONTRACT.

In obedience to a resolution recently passed by Councils, the gas committee yesterday afternoon held its first session to inquire further into the contracts by which the gas trustees in 1879 inflicted upon this city a loss of $7,610 in the Jesse W. Starr $46,600 4-in. pipe contract. Walter Wood, of R. D. Wood & Co., produced a letter from Chief Engineer Park, under date of Aug. 20, 1879, inviting proposals for 10,000 12 ft. lengths each of 3 and 4-in. cast-iron pipes, standard weight. In response he bid to furnish the 3-in. pipe, 11 lbs. to the foot, at 15⅝, and the 4-in., 16 lbs., at 22½ cents per foot. Subsequently he saw Mr. Park and James McManes, was told that heavier pipe would be required, and asked to frame a new bid for 3-in. pipe weighing 12½, and 4-in. pipe weighing 18 lbs. to the foot. He bid 16 9-10 and 23 9-10 cents respectively per foot. The contract was awarded to Mr. Starr. The clerk read several extracts bearing upon the matter from the record of former investigation. The investigation will be continued.—*Philadelphia Times*, 23d.

ENGINEERS' CLUB OF PHILADELPHIA.

Record of Regular Meeting, April 15, 1882.—President Rudolph Hering in the chair; 24 members and 1 visitor present. Mr. J. J. de Kinder read the first part of his paper upon the construction of dykes, banks, levees, etc., in Holland.

Miscellaneous communications, etc., were presented.

Record of Business Meeting, May 6, 1882.—Mr. D. McN. Stauffer in the chair; 25 members and 3 visitors present.

The memorial to Congress of the American Metrological Society, asking for the adoption of means by which a common meridian might be established for the reckoning of longitudes and local time, was presented and unanimously approved. The pamphlet from the American Society of Civil Engineers upon standard time for the United States, Canada and Mexico, accompanied by questions to interested persons with regard to the various proportions, was presented and discussed.

The objects set forth in House Bill number H. R. 4726, entitled "*A Bill authorizing the President to appoint a commission of experts, skilled in the investigation, production and use of metallic substances and other structural materials, to execute tests and experiments on iron, steel and other materials used in the construction of bridges, buildings and mechanical structures and deduce useful rules therefrom*," were unanimously approved and a committee appointed to transmit to our members of Congress the sentiment of the Club upon this subject, and to take such action as might best further the interest in this bill.

The following were declared elected active members of the Club, viz.: I. H. Wingate, Wm. J. Gray, Samuel Rea, Wm. Lorenz, Wm. E. Partridge, Wm. H. Derbyshire, E. M. Seitz, W. W. Coe, D. W. Flickwir, W. C. Wetherill, Washington Jones and W. M. Black.

Mr. Russell Thayer exhibited a section of an underground conduit for electric light, telegraph or telephone wires.

HARTFORD, May 24.—The contract for building the Valley Railroad extension, from this city to Springfield, Mass., has been awarded to Adam Driesbeck & Co., of New York.

GENERAL INTELLIGENCE.

☞ *We solicit and are always pleased to publish in these columns any items of interest that may be furnished us.*

GAS AND WATER.

SOMETHING FOR THE SCIENTISTS TO INVESTIGATE.—In the town of Riga, this county, the only reliable wells are artesian. There are a large number of these wells in use. From the center of the town north and south, and running back to the west part, these wells range from 70 to 120 ft. deep. In some of them the water rises to the surface, and it is believed that they all strike the same vein of water, the difference in the depth being due to the conformation of the ground. A day before the coming of a northwest wind or a storm from that direction, the water in these wells becomes so muddy as to be entirely unfit for use, and the water has a strong and very disagreeable odor. The only way the farmers obviate this difficulty is to dig a well beside the bored one, tap the pipe below the point to which the water rises, and let it run into the dug well to settle. But all who depend on the water in the bore are afflicted with this changing of its character, which invariably precedes the northeast wind or storm, it acting in the capacity of a barometer, which never fails, but which is exceedingly disagreeable in its operations. The wells subject to these changes are distant about twenty miles from the nearest point on Lake Erie, the whole southern tier of towns in Monroe County having to be crossed to reach the bay. At all other times the water is apparently of excellent quality.—*Adrian (Mich.) Times.*

PHILADELPHIA GAS.—In Common Council chamber President Lex presented a communication transmitted to him by a New York Association, the Hydrogen Company of the United States, through W. W. Harkness, of Philadelphia. The company proposes to lease the Gas Works for twenty years at a five per cent. rental upon a valuation of not less than $12,000,000, nor more than $15,000,000. All needed improvements will be made, the city to take the additional works from the company at their cost, or the lessees to have the privilege of purchasing the works at an appraised valuation at the expiration of the lease. The company guarantees that illuminating gas of 17 candle-power, of uniform composition, of density not to exceed .550 and containing not more than ten per cent. of carbonic oxide, shall be delivered to the consumers at $1.35 per 1,000 cubic feet. Heat gas can be supplied for $1 per 1,000 feet. General Herman Haupt, who in August, 1879, proposed to furnish gas manufactured by the Beatley & Gill process and apparatus to the city is still one of the company's consulting engineers.

The communication was signed by Robert W. Rutherford, William H. Grenelle and James Pearson Gill, president, general manager and chief engineer of the company.

CIVIL SERVICE IN CAMDEN.—The Water Committee of Camden City Council has displaced all the Republican office-holders in the department and substituted Democrats in their places. The committee, which is mainly composed of Democrats, refrained from making any changes, though strongly urged to do so, until the new engine and boilers had been placed in position.

SURVEY.—Engineer E. C. Davis, of Northampton, has been engaged by the Town Committee, of Easthampton, Mass., having the question of the water supply of the town in charge, to make a survey of the Turkey Brook route, including the location of the dam reservoir and the water main to Loudville. This brook is on the east side of Turkey Hill in Westhampton, and would give Easthampton nearly a 250-ft. head of water. It would necessitate nearly four miles of main pipes to reach the village, but most of the way the pipes could be laid in a straight line with easy digging and a down grade. A preliminary survey of the same route was made last year by the students under Prof. Sawyer.

WATER-WORKS ASSOCIATION.—The officials of water-works in New England are about to organize an association. Such a society will be of great service in advancing some of the important questions which concern the management of public water supplies, such as waste, etc.

CORSICANA WATER-WORKS.—The City Council has

two propositions before it for the building of water-works, and both are considered advantageous. A committee has been appointed to look into the matter, and it is supposed definite action will soon be taken.

STOPPAGE OF WASTE.—Thomas J. Bell, Assistant Superintendent of the Cincinnati, O., Water-works, has successfully introduced the microphone to detect the waste of water in dwellings. The *modus operandi* of detecting leaks is as follows: Place a key on the stop, turn the same partly off; then screw the detector on the key, place your ear to the detector, and if no sound is heard it is evident that no flow of water exists. If a sound is heard, either faintly or loudly, turn the stop entirely off. If a sound is still heard, then the leak exists between the stop and main pipe. In case the box is full of mud, endeavor to force the wooden rod through same to service pipe or stop, and then apply detector to the rod.

GAS WORKS.—The contract for the stone-work of the new gas works of Erie, Pa., has been let, and operations will be commenced in a few days.

CHEAPER INSURANCE AND A WATER SUPPLY.—GALVESTON, Tex., May 20, 1882.—There can be no question as to the great benefit to be derived by Galveston from bountiful supply of fresh water, when obtained; but while waiting for this, under the plan now before the City Council for its approval, which plan provides that work thereon may be commenced within six months after adoption of the ordinance and to be completed in 24 or more months thereafter, is there not a pressing need for a system, using the salt water from the bay, if only for the extinguishment of fires? I propose submitting to the council at its next meeting proposals from parties competent in every particular, capable of giving bond in any amount for faithful performance, to furnish in the district suggested a perfect system, engines, boilers, pumps, necessary buildings, hydrants (triple-plug hydrant at every street intersection), complete: when (and at any subsequent time) as a test eight streams are to be thrown to avertical height of 100 ft. each, for $49,000. The plan may be variously modified down to $40,875, always ready, only requiring hose to be attached. It can be completed ready for use within six weeks from date of contract, if required. The pipes will be treated to resist the action of soil and climate. It may be extended in any direction when required, say to the cotton presses, depots, etc. When fresh water is obtained this system may be adapted to its use at shortest notice. In the meantime it will have paid for itself twofold if no fire has called for its service. First, to the taxpayers by a reduction in expenditures for the fire department. Second, to the property owners by a reduction of insurance premiums, all within three years from its adoption. Is not this plan worthy of consideration? There are no "millions in it;" not a dollar to any person except the contractors. C. M. MASON.

WILL BUILD WATER-WORKS.—Paris, Ont., Canada, will build $30,000 worth of water-works.

LOAN NEGOTIATED.—The new Phœnixville (Pa.) 4½ per cent. water loan has been negotiated to the extent of $30,000.

NEW ENGINE.—The Board of Public Works of Cincinnati adopted a resolution authorizing the engineer of the water-works to proceed with the construction of an engine in accordance with plans and estimates already made by him. The engine is needed, in order to insure a supply during the summer. It will have a capacity of 33,000,000 gallons.

ARTESIAN WELLS are to be bored at every water station along the line of the Georgia Central Railroad.

THE CORLISS PUMPING ENGINES, originally built for the city of Boston, were inspected by the city officials of Providence on last Saturday. They are now the property of Providence, and are pronounced satisfactory.

REPORT WATER COMMISSIONERS OF ST. LOUIS.—The total cost of operating the water-works and supply system last year was $253,629, an increase of $28,647 over the previous fiscal year. The three low-service engines ran 14,372 hours, used 308,774 bushels of coal, and pumped 9,032,419,000 gallons of water during the year. The three high-pressure engines worked 16,814 hours, used 833,808 bushels of coal and pumped 9,852,430,000 gallons. The total expense of repairing and operating the six engines was $184,427, divided into $50,027 for labor, $121,476 for coal and $7,670 for repairs. The cost of pumping 1,000,000 gallons by the low-service engines was $5,329, and by the high service $13,046; total, $18,375. The quantity of sediment removed from the settling basins during the year was 121,190 cubic yards, at a cost of $2,875. One hundred and thirty-four meters were set. The daily consumption was 27,500,000 gallons. At present the water-pipe laid in St. Louis is: 68,414 feet of 3-inch, 9,329 feet of 4-inch, 825,107 feet of 6-inch, 3,570 feet of 8-inch, 46,353 feet of 10-inch, 59,685 feet of 12-inch, 42,038 feet of 15-inch, 82,432 feet of 20-inch, 16,670 feet of 30 inch, 33,213 feet of 36-inch; total, 1,186,811 feet, equal to 224 4-5 miles, of which 47 7-10 miles were laid since October, 1877, or under the new charter. During the year $8,335.69 was expended in removing the sediment from the old reservoir on Benton street, and materials were sold from this reservoir to the amount of $1,276.80.

THE WATER SUPPLY BILL.—The bill to increase the water supply of the District to come up in the Senate as unfinished business, directs the Secretary of War, after making provision for necessary surveys and acquirement of title to the land necessary to extend the aqueduct from its present terminus to the high ground north of Washington, near 6th street, extend and to construct at that point a reservoir of capacity of not less than 300,000,000 gallons, to erect the necessary gate-houses, lay necessary main connections, etc., and also to complete the dam at Great Falls to a level of 148 feet above tide, and extend it across Conn's Island to the Virginia shore. The bill appropriates $51,370 to pay for land for the aqueduct extension, and $599,534.55 for the extension; for main connections $165,400; to pay for land for reservoir $35,250; for work and material in constructing reservoir and gate-house, $431,273.75; to pay for water rights and land necessary to extend dam, $45,000; to protect the canal from flooding, $12,300; for work and material to complete the dam, $145,151; making a total appropriation of $1,485,279.30. Full authority to obtain title to all land necessary by condemnation is given the Secretary of War and Attorney General.

ELECTRICITY.

WILL USE ELECTRICITY.—A special election in Xenia, O., recently resulted in favor of electric light by a large majority.

THE BRAZILIAN CABLE SCHEME will, its advocates assert, positively be carried out.

PROPOSED ELECTRIC LIGHT.—It is proposed to light Dubuque, Iowa, with electric light—56,000 candle power—located on eight towers at prominent points in the city.

THE BRUSH-SWAN Electric Light Company, of New England, have filed articles of incorporation at Albany. Capital $2,000,000.

EXPERIMENT in an underground telegraph will be made by Mr. Warrell, a well-known brass founder of Pittsburgh, Pa. Right has been granted by the city. The cable to be used in this experiment is of corrugated lead, 1 inch in diameter, perforated with five small holes, each of which is insulated in a composition which is the inventor's secret, and wrapped in cotton is a fine copper wire. This cable is capable of being increased in size and capacity, and if it is operated successfully wires can be so laid under ground at less expense than they can be stretched on poles.

STREETS, DRAINAGE, ETC.

RECLAMATION OF THE POTOMAC RIVER FLATS.—The Senate committee on improvement of the river front at Washington examined Col. Geo. E. Waring, of Newport, R. I., as to the effect of the flats and the benefits to be obtained from the projected improvement. He testified that on the 18th of last August he made, at the request of Col. Rockwell, an inspection of the White House and grounds, with the view of recommending sanitary improvements. In the spring of 1880 he prepared a paper to be read befor the Smithsonian Institution, and before preparing that he took occasion to examine the Potomac flats and the Anacostia flats very thoroughly. He had also examined the late Major Twining's plan of reclamation, and had talked with him about it. He would approve part of the plan, but would change the proposed order of the work somewhat. He regarded a thorough system of sub-soil drainage for the low-lying portions of the city as necessary in order to remove the prevailing causes of disease. In order to provide such a system for the low grounds it would be necessary to have the sub-soil drainage empty into a canal made for that purpose, to get sufficient fall, and it would have to be removed from this canal and into the river by pumping. Such a thorough system of under-drainage as he proposed would obviate the necessity of filling the flats. In short, he would drain them dry and keep them dry (first building a sea-wall between them and the river) by this system of under-drainage. The proposed plan would, if carried out, be beneficial to the health of the city, but, he believed, not to the extent the committee was seeking. It would undoubtedly, though, be a public benefit to fill the flats.

SEWERAGE SYSTEM.—The City Council, of Winnipeg, has appropriated $500,000 for sewerage.

THE handsome little city of Williamsport is in trouble about its pavements. This is not a particularly new thing, however, since the city has been in trouble about the pavements ever since they were put down and the municipal debt was put up. But the present trouble is rather different from the recent ones. The time has come when something must be done about replacing the pavement, which a dozen years or so ago cost the city something like half a million dollars. It is all worn out and the streets are in a disgraceful condition. Strange as it may seem, there are those who favor repaving with the Nicholson blocks, although the experiment with them has been anything but satisfactory. The chief recommendation is that wood is cheap in Williamsport. One thing the citizens will probably not do this time, no matter what kind of pavement they decide upon: They will not run into debt another six or seven hundred thousand dollars. They have learned that debts can only be disposed of by paying them and they are naturally a little shy about pavements and debts.—*Philadelphia Times.*

SEWER SURVEY.—A survey for the proposed sewer on Pleasant street, Northampton, Mass., is being made, though on just what plan it will be constructed is not yet decided.

STREET IMPROVEMENTS.—The Boston Board of Aldermen has passed orders to pave Broadway extension with small granite blocks, at an expense of $16,200; to pave the sidewalks on Dorchester avenue, between Dorr and Swett streets, at an expense of $20,000; to grade and gravel Norfolk street, between the New York and New England Railroad bridge and Walk Hill street, at a cost of $3,300; to grade and gravel Cushing avenue, from Hancock to Pleasant street, at a cost of $15,500; to underdrain and macadamize a portion of Neponset avenue, between Pope's Hill and Neponset River, at an expense of $15,000.

EIGHTEEN PUBLIC DITCHES, costing in the aggregate over $100,000, are now being built in Wabash County, Ind.

BIDS FOR STREET WORKS.—Bids were opened before the District Commissioners for grading and regulating South Capitol street, from M street to the river, the work consisting of grading, including the hauling, graveling, laying of bluestone curb, cobble stone gutters and brick sidewalks. Also, for laying asphalt pavement on Sixteenth, from N to R streets northwest, and C, from Third to Four-and-a-half streets northwest. Also granite block pavements on C, from First to Third streets northeast; Third, from C to D streets southeast; C, from Second to Third streets northwest; First, from Massachusetts avenue to H street northwest; First from Defrees to I streets northwest; Nineteenth, from M to N streets northwest; Twenty-sixth, from Pennsylvania avenue to K street northwest; Twenty-ninth, from M to N streets northwest.

The bids for grading and regulating South Capitol street, and granite block pavements on the other streets named above, were as follows:

James Reynolds, grading, per cubic yard, 19c.; hauling, 1c.; gravelling, 8c.; setting curb, 8½c.; laying gutters, 18c.; laying brick sidewalks, 10c.; laying granite block pavements on C, between First and Third streets northeast, 75½c.; on Third, between C and D streets southeast, 75½c.; on C, between Second and Third streets northeast, 75½c.; First, between Massachusetts avenue and H street, 75½c.; First, between Defrees and I streets northwest, 74½c.; Nineteenth, between M and N streets, 80c.; Twenty-sixth, between Pennsylvania avenue and K street northwest, 80c.; Twenty-ninth, between M and N streets, 75½c. Mr. Hines (corresponding figures), 18c., —, 13c., 10c., 30c., 9c., 69c., —, —, 69c., 69c., —, —, —. Thos. Joyce, 25c., ½c., 12c., 12c., 40c., 14c., 75c., 73c., 71c., 75c., 75c., 72c., 70c., 72c. Wm. Hussey, 20c., ½c., 8c., 11c., 25c., 10c., 76c., 76c., 76c., 76c., 76c., 76c., 76c., 76c. Patrick Maloney, 22c., ¾c., 15c., 8c., 30c., 11c., 66c., 64c., 66c., 67c, 68c., 68c., 64c., 68c. John Cudmore, 19c., ½c., 12c., 10½c., 19c, 9c., 65½c, 66c., 61c., 64c., 64c., 63c., 59c., 59c. Samuel C. Mills and Morris F. Talty, 16c., ¾c., 6c., 14c., 26c., 14c. 84c., 84c., 85c., 80c., 80c., 80c., 78c., 78c.

Asphalt Pavement.—A. L. Barber, Sixteenth, from N to R streets, asphalt, $2.26; granite block, $2.58; C, between Third and Four-and-a-half streets, asphalt, $2.26; granite block, $2.58. H. L. Cranford, Sixteenth, from N to R streets northwest, asphalt, $2.28; granite block, $2.60; C, between Third and Four-and-a-half streets, asphalt, $2.28; granite block, $2.60.

The material in all cases of granite block to be furnished by the District. No awards have been made.

SEWERAGE SYSTEM.—At a mass meeting of citizens of Lake View, Ill., held Saturday night last, to consider the question of constructing an independent system of sewerage, resolutions were passed instructing the trustees to conclude negotiations with the city for the use of the Fullerton avenue conduit, and if the city's consent was not obtained, to commence the construction of an independent system on the line of Fullerton avenue.

ST. LOUIS expects to pay $100,000 damages resulting from the Mill Creek overflow.

RIVERS AND HARBORS.

THE WORK OF DREDGING THE WASHINGTON (D. C.) CHANNEL of the river is still progressing successfully, and the island formed by the mud excavated is about 8 acres in area.

A BIG DIKE.—A Frenchman has laid before the Académie a brilliant scheme for producing perpetual spring in England and France by constructing a dike 500 miles long across the North Sea, to keep out the cold currents of water and floating ice.

RAILROADS.

WE can scarcely comprehend the magnitude of the railroad work being done beyond the Pecos. While we are going quietly about our business, hundreds of men are at work forging a passage-way for the iron horse through the mountains and ravines of Western Texas, and through trains from San Francisco will come whirling along here almost before we know it. Two years ago a trip from here to El Paso was a weary and tedious one, often filled with danger; in a very few months it can be made in a Pullman palace car, right on a good portion of the line the stages used to traverse. —*San Antonio Express.*

THE *Two Republics*, of the City of Mexico, remarks: Railway construction advances. From the capital toward the north and from the Rio Grande south the iron bands are hastening to meet. The day is not far distant when the connection will be made, and the tourist taking the cars at New York will alight in the City of Mexico with hardly a change. With railway communication accomplished, travel toward Mexico will increase, commerce be stimulated and the two countries bound in closer accord. The Mexican Central Railroad is pushing straight for the northern frontier, and is also rapidly advancing south. The progress made by this road is truly remarkable.

ELEVEN hundred men are now employed on the main line extension of the Milwaukee, Lake Shore & Western Railway.

IT is rumored that the Grand Trunk will build an extension from Charlotte to Kalamazoo, which will tap Hastings, Mich.

GRADERS are busy on the Little Falls & Dakota Railroad.

NOTWITHSTANDING the work on the International is now suspended in Mexico, a full corps of draftsmen are kept at work at Laredo in making maps and profiles of the work on the extension to the city of Mexico; besides, the work on the costly iron bridge across the Rio Grande is being pushed rapidly every day in the week, Sunday not excepted, which is an evidence that the suspension of work in Mexico is only temporary.

THE Fremont & Lincoln Railroad is under contract to Fitzgibbons, of Plattsmouth. There is an arrangement with the Chicago, St. Paul, Minneapolis & Omaha Railroad, by which the latter will run its trains to Lincoln when the road is completed. The projected track is through an easy country, and it is probable that the road can be finished for business some time this year. The grading on the Scotland line is delayed by the wet weather of last week, and will not be finished this month. The bridging is to be completed by July 4. It looks now as if the road would not be surfaced up ready for regular trains before the last of July.—*Sioux City Journal*

THE RISING WATER in Red Chute Swamp delays the work of construction on the Vicksburg, Shreveport and Pacific railways.

MAYBE A MAN FEELS HAPPY and proud, and flattered,

and envied, and blessed among men when he sees a pretty girl trying to raise a window on a railway car, and he jumps up and gets in ahead of the other boys, and says: "Allow me?" oh, so courteously. And she says: "Oh, if you please, I would be so glad," and the other male passengers turn green with envy, and he leans over the back of the seat and tackles the window in a knowing way with one hand, if peradventure he may toss it airily with a simple turn of the wrist; but it kind of holds on, and he takes hold with both hands, but it sort of doesn't let go to any alarming extent, and then he pounds it with his fist, but it only seems to settle a "leetle" closer into place, and then he comes around, and she gets out of the seat to give him a fair chance, and he grapples the window and bows up his back, and tugs, and pulls, and sweats, and grunts, and strains, and his hat falls off, and his suspender buttons fetch loose, and the vest-buckle parts, and his face gets red, and his feet slip, and people laugh, and irreverant young men in remote seats grunt and groan every time he lifts, and cry out, "Now, then, all together!" as if in mockery, and he busts his collar at the forward button; and the pretty young lady, vexed at having been made so conspicuous, says in her iciest manner: "Oh, never mind; thank you! It doesn't make any difference," and then calmly goes away and sits down in another seat; and that wearied man gathers himself together and reads a book upside down—oh, doesn't he feel good, just.—*Burlington Hawkeye.*

THE West Shore & International Bridge Railway Company; capital, $250,000, to run from Cheektowaga, Erie County, to the International Bridge, in Buffalo, has been incorporated.

THE St. Paul, Kasson & Iowa Railway Company has been incorporated, to build a line of railway from St. Paul southward to Kasson, Dodge County, and from thence to the Iowa State line. The officers are: L. E. Cowdery, President; William Wheeler, Vice-President; L. G. Nelson, Secretary; George B. Arnold, Treasurer.

WHATEVER the future may bring about, little credence should be given to the reports from New York in regard to an accomplished consolidation of the Boston, Hoosac Tunnel & Western with other roads. The road in question holds the contract of the Continental Construction Company to extend the road to Buffalo and other points, and should the courts of New York decide that the charter of the road is a legal one, as is now likely to be the result, there is also a contract with responsible English and Canadian parties to take the construction of the road from the hands of the Continental Company and complete it. It is very probable that there will be important developments in connection with the Boston, Hoosac Tunnel & Western before long, of which the public will be advised.

A CONTEMPORARY says the Massachusetts Central Railroad Company paid its employés a month's wages on Tuesday, but is still about seven weeks behind in its payments. The employés, while inclined to grumble, are still willing to await the result of the adjourned stockholders' meeting on June 1, when it is believed a plan for adjusting all the financial difficulties will be decided upon.

THE Lake George extension of the Delaware & Hudson Railroad and Canal from Glens Falls to Caldwell will be completed June 1. This does away with the stage line.—*Boston Journal*

THE ASHLAND BRANCH.—Ashland (Wis.) *Press:* A party of engineers, under Division Engineer Carrington, have been engaged during the past week in running a line for a branch road into Ashland from the North Wisconsin Railroad. The new road will have two tracks into town, one running along the bay front to the saw mills, and the other to a connection with the Wisconsin Central's depot grounds. We have not seen the profile of the new survey yet, but are informed that no difficulties are encountered, and that the line will be easy to construct, with light grades and curvature. When the work of building the connection will be commenced we are not informed, but it is confidently expected by our mill-men that the road will be completed to Ashland and operated this fall.

RAILROAD CONSTRUCTION SINCE JANUARY 1.—NEW YORK, May 20.—It will, as *Public* truly says, astonish many to be told that the number of miles of railroad built thus far this year is 2,508, against only 1,018 reported at the corresponding date last year, 1,264 in 1880, 493 miles in 1879 and 312 in 1878. Reckoning the cost of roads at the rates current when contracts for labor and material were made, we may estimate that the new railroads built since January 1 must have cost nearly $75,000,000. It would not be surprising if, after a partial failure of crops, an investment of capital at a rate of nearly $16,500,000 per month in fixed forms should temporarily exhaust the supply available for railroad building.

THE MEXICAN NATIONAL.—The $3,000,000 additional subscription to the Mexican National subscription closed on Monday. This completes the lines of the road respectively to Monterey, Celaya and Morelia on the main division now building. Completion to these points gives the system a mileage of 729 miles of track. Monterey will be reached by Sept. 1. The other points in October.

THE OREGON RAILWAY AND NAVIGATION COMPANY.—The stockholders of this concern are to be called upon at the annual meeting in Portland, Oregon, June 19, to sanction the construction of a large addition to their present mileage, as will be seen by the following statement of new construction proposed: First, a line from the city of Walla Walla, in Washington Territory, in a generally northeasterly direction to Snake River, at or near Texas Ferry, and thence following the valley of the Snake River to Lewiston in Idaho Territory, with a branch from a point on said line about three miles south of Grange City, in a generally easterly direction, to the said city of Lewiston. Second, a line from the said city of Walla Walla to the town of Pendleton in the county of Umatilla in the State of Oregon. Third, a line from a junction with the present railroad of said company, between the Dalles and Umatilla in the State of Oregon, at a point at or near the month of John Day's River, up the valley of said river a distance of about 90 miles to the big bend of said river, with a branch from said line from a point at or near the mouth of Rock Creek, up the valley of said Rock Creek to a point about 30 miles distant from the mouth thereof. Fourth, a line from a junction with the road of said company, extending from the Dallas to Umatilla in the State of Oregon, at or near the mouth of Willow Creek, up the valley of Willow Creek to the town of Heppner. Fifth, a line from a point of junction with the present located line of said company's road from Umatilla to Baker City, at or near the mouth of Butter Creek, up the valley of Butter Creek to a point 30 miles distant from the said point of junction.

THE CANADIAN PACIFIC.—WINNIPEG, Manitoba, May 22.—Gen. Rosser, recently chief engineer of the Canadian Pacific, was to-day committed by a police magistrate for trial on a charge of appropriating certain plans owned by the company. Bail was accepted in $4,000.

Chief Davidson, of the Manitoba Southwestern, has retired, and returned to New York, W. E. Teasdale being appointed acting chief engineer.

A RACE TO DEVIL'S LAKE.—Grand Forks (Minn.) *Plain Dealer:* A gentleman whose statement can be relied upon arrived in Grand Forks yesterday, and stated that in an overland trip from Devil's Lake he had run across two large surveying parties. One party represented the St. Paul, Minneapolis & Manitoba Rail road and the other the Northern Pacific road, and both seemed to be running a grand race for the Devil's Lake region. When discovered, both parties were encamped about 20 miles west of Larimore. The Northern Pacific surveyors evidently started out from the Mayville terminus, and while both were running lines in the general direction of Devil's Lake, one line was bearing toward the north of Stump Lake and toward the town of Wamduska, and the other was bearing toward the south shore of the lake, and toward Fort Totten. The same gentleman also brought in the information that the foreman for Col. O. L. Towner, of the Elk Valley Farming Company, started out of Larimore one day behind the party, with a complete camping outfit, prepared for a long siege, and would follow the surveyors for the purpose of definitely ascertaining where the line will go, and of selecting eligible locations for town sites.

THE ONTARIO & QUEBEC RAILWAY.—It is said that Mr. Hugh Ryan, of Perth, was on Tuesday of last week accepted as a member of the C. P. Syndicate. The qualifications which operated in making the ballot for his acceptance "clear" were his financial reputation, and his large experience as a contractor. At the meeting in New York on that day it was decided to proceed at once with the Ontario & Quebec Railway from Toronto to Ottawa, the link from Perth to Sharbot Lake being taken up first. $5,000,000 will be spent upon this work, $2,000,000 of which are now placed at Mr. Ryan's disposal. It is the policy of the syndicate to give the control and management of the different divisions of their work to separate members. Thus Mr. Van Horn has charge of the lines in Manitoba and the Northwest, Mr. McIntyre looks after the Canada Central, its extension, and the Quebec, Montreal & Ottawa, and Mr. Ryan will be responsible for the Ontario & Quebec.—*Central Canadian.*

ATCHISON, TOPEKA & SANTA FE.—A dispatch from Atchison, Kan., says: "The intelligence that the Atchison, Topeka & Santa Fe road has succeeded in their loan for $10,000,000 satisfactorily in London at 6 per cent., quickens the railroad pulse in this centre. The fact that this gigantic corporation had laid off 2,000 men from active employment in less than two weeks between here and Old Mexico was seriously considered. In conversation with Contractor J. S. Fiske, who operates the entire improvement force in Atchison, he stated that, although he had not received express orders for such action, the intimation was that he might prepare for work."

A NEW WISCONSIN ROAD.—Surveyors are now going over the route for the Galesville & Trempealeau Railroad. It is impossible to form any opinion in regard to the result of this railroad project. It will receive strong opposition, but may possibly succeed.

OPERATIONS IN WISCONSIN.—Eleven hundred men are now employed by the Milwaukee, Lake Shore & Western Railway Company on the main line extension north of Summit Lake, in Langdale County, the present operating terminus.

TEXAS ROAD.—The construction train of the East Line Railroad has reached McKinney. The depot has not yet been located.

PROGRESS IN IOWA.—The track of the Chicago, Milwaukee & St. Paul has reached Dedham. The road-master states that the road will be finished to Council Bluffs by July 4.

RAILROAD AND BRIDGE CONTRACTS.—Reports received at the offices of the Wisconsin & Michigan Railway state that the surveys on the Ontonagon & Brule River line have completed the survey from the terminus of the constructed portion of the Ontonagon road to Iron River on the Wisconsin state line, and will return to Ontonagon at once. The officials say it is a straight and low-grade route, and will connect at Iron River, with the Wisconsin & Michigan. The officers of the latter road are about to let contracts for the construction of the bridge work on the twenty-five miles of road in process of grading. They are seriously contemplating letting a contract for another twenty-five miles grade, north of the terminus of the last contracted portion of road. This will take the line within twenty miles of Iron River, on the state line.

RICHMOND, VA.—The dock connection trestle and bridge of the Richmond & Allegheny Railroad was tested by the officials on the 13th, and the road opened for traffic. Extensive improvements are planned for the dock property owned by the railroad; side tracks, new wharf-lines and store-houses will be built, and also coal-chutes and other facilities for the quick loading of vessels.

ROUTE SURVEYED.—A route has been surveyed from Fond du Lac to Oshkosh for the Milwaukee & Lake Winnebago Railway Company.

EXTENSION COMPLETED.—The Denver Extension of the Chicago, Burlington & Quincy from the Missouri River to Denver was completed Thursday. There has been a great deal of enterprise shown in this work. As many as three miles of track have been laid in one day during the progress of the work.

TEXAS MEXICAN RAILROAD.—The track is now 100 miles from Laredo. Over two miles were laid on May 18.

THE ST. LOUIS & SAN FRANCISCO.—A dispatch from Springfield, Mo., says Engineer M. L. Randall, of the St. Louis & San Francisco Railroad, who surveyed the Arkansas branch, will start from this place next Monday to survey a line of a proposed branch of the 'Frisco Railroad from Springfield to Harris, Ark., going by way of Ozark. No definite conclusion has yet been formed as to the route or the objective point, which will depend largely upon the report of the engineer.

PROJECTED ROAD.—The New Orleans *Picayune* states that Mr. R. T. Wilson, formerly President of the East Tennessee, Virginia & Georgia road, has consummated arrangements under which he proposes to build a line from New Orleans, on the east bank, via Baton Rouge and Vicksburg, to along Deer Creek, through the Yazoo Valley to Memphis, Tenn., with a branch leading from a point on the main line to the Mississippi River, opposite Arkansas City, and also a branch from near Vicksburg to Yazoo City.

THE NORTHERN PACIFIC RAILROAD COMPANY.—This company has in its eastern division main line 970½ miles of completed road, and in its western division main line 380½ miles, making a total mileage on May 1 of 1,351, or an increase of 360 miles since Jan. 1, 1881. Between the eastern and western divisions there is a gap of 593 miles. It is calculated that 400 miles of this gap will be built this year, leaving to be constructed in 1883 only 193 miles, when there will be a continuous road between Lake Superior and St. Paul in the East and Portland and Puget Sound in the West

PROPOSED RAILWAY EXTENSION.—Officers of the Gulf, Colorado & Santa Fe Railway Company, operating 500 miles in Texas, are in Chicago conferring with the Chicago & Alton Railroad officials, and have submitted a proposal that the latter extend its lines from Kansas City to the northern boundary of the Indian Territory; that the Gulf, Colorado & Santa Fe Railroad extend its lines from Fort Worth to the southern boundary of that territory, and that the two interests unite in a third company and build a line across the Territory 100 miles west of the Missouri, Kansas & Texas, each road to bear half of the expense, and the Gulf road to send 400,000 bales of cotton yearly over the Chicago & Alton Railroad. The latter give very little encouragement to the plan.

THE LAKE GEORGE RAILROAD.—The work of laying the track of the new Glens Falls and Lake George Railroad is completed.

W. & M. R. R.—Mr. Dawson, of the contracting firm of Dawson, Symmes & Co., arrived in Green Bay, and will at once begin preparations for the grading work on the Wisconsin & Michigan line. The contract taken by this firm for the construction of 25 miles of road above Stiles, will be placed in charge of a general construction superintendent, who will in turn sublet the entire work. The State line will probably not be reached before the end of the season of 1883.

BUILDINGS.

OFFICE BUILDING.—Parke Goodwin will erect a nine-story building for stores and offices, which will front on Nassau street, Liberty street and Liberty Place, N. Y., on the site of the old *Evening Post* building. It will cost $189,700, and will be constructed of stone, terra cotta and iron. A. J. Bloor is the architect.

SCHOOL-HOUSE.—Fergus Falls, Minn., will build a school-house to cost $23,300.

ANNAPOLIS, Md., wants $100,000 from Congress for the construction of a public building within her small limits.

NEW AXLE WORKS.—Messrs. Hubbard, Bakewell & Co., have about completed their new axle works on the Allegheny River, near Pittsburgh. There are three buildings in all, the forge department being 300×50 ft., the grinding and polishing department, 348×46 ft., and the engine and boiler house, 228×50 ft.

HANNIBAL, Mo., will have a government building, whose cost must not exceed $75,000.

LARGE UNION DEPOT.—HIAWATHA, Kan., May 20.—At a railroad meeting here to-day, Col. A. S. Everest and Superintendent Harding, of the Missouri Pacific, made a proposition to the city to make Hiawatha the headquarters of a division, and to build here the largest union depot on the line, car works and repair shops, in consideration of the donation of the local stock in the company and ten acres of land. The proposition was unanimously accepted and the contract signed. Col. Everest says work will be begun on the car shops before June 1. There is great enthusiasm here over the important event.

FORT IMPROVEMENTS.—The plans and specifications for the improvement of Fort Omaha, Nebraska, so as to make a ten-company post, contemplate an expenditure of $162,892, for which Congress will at once be asked to make an appropriation.

THE NEW ENGLAND MARBLE COMPANY has filed articles of incorporation at Albany. Capital, $500,000.

BIG ROOF TRUSS.—The big trusses of the steel-mill roof at Indianapolis are 120 ft. long—the largest span in the State—with a pitch of 20 ft. or near it, and as the huge triangle slowly mounts to its place it gives to an intelligent observer a good idea of engineering forces employed in modern work. Each of the three sides of the triangle is formed of five heavy timbers, breaking joints and studded with the heads of bolts compacting them as solidly as if they were a single stick, and far more strongly. They are strong enough to make sills for a railroad bridge.

SLAKED AND NOT SLAKED.—The London *Builder* attributes the marvelous durability of mortar in Italy to

the fact the lime remains in a pit covered with water for two years before it is used, whereas in England lime is slaked and used the same day. Most building specifications even require newly slaked lime.

TO ERECT SHOPS.—The Milwaukee & Northern Railway Company have decided to erect in Fort Howard a building to serve as general shops for the present uses of the road. It will be located on their Tanktown property, south of the side track. The building will cost $4,500, and is to be constructed for use for general purposes until the anticipated demand for something on a large scale for car-shops, and then to be transformed into paint shops.

THE steel works projected at Batesville, Ark., will cost, it is estimated, $400,000. They are to be erected and ready for operation this year.

NEW COTTON MILL.—Subscriptions are being solicited for a $500,000 mill in Dallas, Tex. W. G. Veal is at the head of the committee.

BRIDGES.

FAILURE OF A BRIDGE COMPANY.—The Cleveland Bridge and Car Works, at Cleveland, Ohio, have made an assignment. The company recently applied to increase the capital stock from $100,000 to $500,000, but the negotiations were not completed. Maturing paper to the amount of $6,000 went to protest a few days ago. The condition of the company in February, as given by the President, showed assets, $792,004, and liabilities, exclusive of capital stock, $545,091, leaving a nominal surplus of $246,913. The contracts on hand amounted to $1,000,000, and 700 men were employed. The business was started in 1851 in a small way, under the style of Thatcher, Burt & Co. The business was bought by H. M. Claflin, as trustee for the present company. The officers are Henry M. Claflin, President; S. Sheldon, Engineer, and John H. Ashburn, Secretary.

THE CLEVELAND BRIDGE AND CAR WORKS COMPANY have made an assignment to H. F. Sweetzer, of Titusville, and W. H. McCurdy, of Cleveland, who gave bonds in $25,000, and who will complete the contracts and continue the business of the company. The 700 employés were paid off as far as contracts demanded, and in a few days they will be paid to May 1. President Claflin states that the assignment was forced by the pressure of obligations and the difficulty of obtaining ready money. He says that the company's assets are $250,000 greater than its liabilities; that it has contracts to construct $250,000 worth of bridges for the Lake Shore, "Nickel-Plate," Bee Line, Chicago & Atlantic, and Cleveland, Mount Vernon & Columbus railways, and to build about 700 cars, and that the works are worth $325,000, including upward of $100,000 in real estate. The exact assets and liabilities cannot be given for some time. Mr. Claflin thinks the company will be able to resume business in sixty or ninety days.

J. R. SMITH, of Springfield, Mass., has sued the city of Holyoke for $10,000 to recover a balance of $5,000 due for reconstructing the "free" bridge. The authorities claim that the work is defective, and decline to pay till it is made satisfactory.

BRIDGE CONSTRUCTION AUTHORIZED.—The Senate passed the bill authorizing the Texas & St. Louis Railway Company to build bridges in Arkansas over the White River, near Clarendon; over the Arkansas River, near Pine Bluff; over the Sabine River, over the Ouachita River, and over the Red River in Lafayette County where the line of the company crosses.

WAGON BRIDGE.—Work has been commenced on the $25,000 wagon bridge across White River, near Freedom, Indiana.

PLANS have been submitted by Chief Surveyor Smedley, of Philadelphia, for the new Market street bridge over the Schuylkill.

BRIDGE IN SPRINGFIELD, O.—A new bridge is to be erected on East High street, across the railroad tracks.

THE KEYSTONE BRIDGE COMPANY will commence the erection of the long span of the P., V. & C. R. R. bridge across the Monongahela, at Brownsville, about the 1st of June.

THE CORRUGATED METAL CO., of New Berlin, Ct., have now on hand 5 spans, 152 ft. each, for Lowell, Mass.; 1 span, 198 ft., for Conway, Mass.; 4 spans plate girder, for N. Y., N. H. & H. R. R.; 3 spans plate girder, for Danbury & Norwalk Railroad; 1 span, 204 ft., for Waterbury, Conn.; 3 spans plate girder, for Eastern Railroad; 1 span, 90 ft., for North Adams, Mass.; 2 spans, 62 ft. each, West Waterville, Me.; besides a large iron roof for N. Y., N. H. & H. R. R., at New Haven, Conn.

THE C., B. & Q.—ATCHISON, Kan., May 22.—Instead of building a new Missouri River bridge the Chicago, Burlington & Quincy is now talking of a transfer-boat at Rulo, and a branch to the Kansas City and Council Bluffs at Bigelow. This increases the distance from the West to St. Louis and the South 21 miles, and there is nothing to be gained by it except saving the bridge toll at Atchison and the pull over the Troy Hill. Engineers state that they desire to shorten the route and save expense, but this is not practicable as proposed.

WASHED AWAY.—Nearly every bridge in Sopora township, Hancock County, Ill., was washed away by the recent floods.

THE NEW IRON BRIDGE of the Connecticut River Railroad across the Connecticut at Bellows Falls, Vt., was thoroughly tested May 18 and trains began crossing it.

THE HIGHEST BRIDGE.—It is said that the Cañon Diablo bridge, on the Atlantic & Pacific Railroad, north of Prescott, Arizona, is the highest bridge in the world, with one exception. From the bottom of the cañon to the center of the bridge the distance is about 230 ft.

NEW BRIDGES.—The Senate bills authorizing the Texas & St. Louis Railway Company to build bridges in Arkansas and to incorporate the Garfield Memorial Hospital were passed.

THE MEXICAN METHOD.—CITY OF MEXICO, May 22.—Five men who attempted to destroy a bridge on the Mexican National Railway, on Friday last, were caught yesterday, and, by order of the Governor of the State of Mexico, they were immediately shot.

LABOR.

THE PAY FIXED FOR BOSTON LABORERS.—BOSTON, May 25.—The Common Council to-night passed an order fixing the pay of city laborers at not less than $2 per day.

STRIKERS.—Ninety-six laborers and 18 machine men employed at J. C. Dreyfuss & Co.'s brickyard, Jersey City, struck for $60 and $65 a month, respectively, an advance of $10. The yard uses silt from the Hudson River Tunnel. The men were discharged and yard is closed. Either Italians or Chinese will be hired.

STRIKERS.—The bricklayers are habitual strikers. It is their habit to arrange their rate of wages with the builders at the beginning of the season, with the understanding that it is to be adhered to by both parties during the summer. Invariably, however, they make further demands at the height of the season, until their wages are higher than those of any class of laborers among the building trades. This practice of violating faith with the bosses has been severely condemned by other trade union organizations, whose members claim that such a course will not only injure the building trade, but will have a depressing effect on all other trades. The bricklayers of this city now receive $4.50 a day, and they assert that no more demands will be made this year. It is believed by many, however, that next month another strike will be made for an additional 50 cents a day. The trades in which successful strikes have been made so far this season are the bricklayers, stone-cutters, carpenters, painters, plasterers, fresco painters, coach-painters, framers, coopers, cigar-makers, shoemakers, horseshoers, upholsterers, bluestone-cutters and flaggers, some comparatively unimportant trades. Besides these, the hod-carriers made a successful strike. The trackmen on the Hudson River branch of the New York Central Railroad obtained a concession of 15 cents a day from the company; and in several other branches of unskilled labor, such as the marble polishers, cartmen, street sweepers, helpers to artisans and others, an advance of wages was secured.—*N. Y. Tribune.*

THE striking tracklayers near Council Bluffs, Ia., on the Chicago, Milwaukee & St. Paul, have gone to work at the old rates. Enough laborers are offered to take the place of the strikers should the company conclude to dismiss the men.

THE Finance Committee of Philadelphia Councils has reported favorably an ordinance increasing by 10 per cent. the wages of all mechanics in the city's employ.

THE CASTLE GARDEN LABOR BUREAU.—The Castle Garden Labor Bureau reports that of the vast number of immigrants arriving at Castle Garden last week, only ten remain without employment; also, that the demand for all sorts of laborers from almost all parts of the country is as urgent as ever, and that in almost every instance liberal wages are offered. The big steamer City of Rome brought 1,500.

THE plumbers of this city demand $4 per day.

CONTRACTS LET.

A HUGE CONTRACT.—The contractor who has taken the contract to construct 85 miles of the western end of the Canadian Pacific upon the Pacific Coast has made arrangements to import 8,000 Chinamen, 1,200 of whom have already arrived. Upon this contract the work from Emory to Thompson's River, a distance of 60 miles, is probably the most difficult and expensive on the North American continent. In the first seventeen miles there are thirteen tunnels, four in one mile and six in another. In two miles on the division above Emory there are no less than 600 trestles and bridges, and in the last 85 miles more than 100 embankments, which at the foundation level are 17 ft. wide and the cuts 22 ft. The tunnels are 22 ft. wide and 21 ft. high. In the upper section of the work there are 10,000,000 cubic yards of earth, an excavation of 3,000,000 cubic yards of rock, exclusive of the tunnel, and 2,000,000 cubic yards of rock and cemented gravel. Between 30,000,000 and 40,000,000 ft. of timber, board measure, are required for the structures. Over the entire contracts the rock is of the hardest compact granite, in which often occur wide and extremely rich quartz veins. For miles the road is literally hewn out of the side of the cliffs. The approaches to many of the tunnels are galleries. At the eastern approach to tunnel No. 7, for over 100 ft., the bluff is galleried, and overhangs the roadway twenty-four feet in width, or two feet outside the road-bed, below which is an almost perpendicular precipice of 200 ft.

PIPE CONTRACT LET.—A dispatch from Madison, Wis., states that the contracts for furnishing the pipes for the water-works, laying the mains, supplying the hydrants, drilling the wells, and in fact all contracts except those relating to the pumping machinery, have been signed. The work of laying the mains will begin just as soon as the pipe is on the ground, though this will not be for some little time yet, as the manufacture of it has not yet begun.

DAVIS ISLAND DAM.—The contract for furnishing the iron and steel work for the Davis Island dam has been awarded to the Pittsburgh Bridge Co.

STATIONERY CONTRACT LET.—Contracts for furnishing certain articles of stationery for immediate use in the Treasury Department have been awarded to F. G. Fisher, J. D. Free, Jr., Wm. Ballantyne & Son, of Washington; E. D. Lockwood, of Philadelphia, and White, Corbin & Co, of Rockville, Conn.

BIDS FOR FURNISHING LABOR for the new court-house at Baltimore were recently opened. M. A. McGowan, of Washington, was the lowest bidder, $38,987, and will probably be awarded the contract. For furnishing bricks and skew-backs, the Maryland Brick Company, of Baltimore, were the lowest bidders. Bids for the court yard roof and ceiling of the custom house at Cincinnati were also opened. Snead & Co., of Louisville, Ky., were the lowest bidders—$51,880.

STATE OF TRADE IN SOUTH AMERICA.—From the Buenos Ayres *Herald* of the 11th ult. we take the following: In many respects the condition of the country never was better. Trade is good; money is plentiful; the provincial paper currency, which, in spite of the mint and the comparatively heavy work going on there, is likely to be the favorite circulating medium for a long time to come, is at par, at which rate it is likely to remain all the winter. The camps are in good condition, sheep increasing to such an extent that thousands have to be sold off by those who are unwilling to assume the responsibility of more land, and the prices of produce are very remunerative to farmers and agriculturists.

CONTRACT FOR VALVE CHAMBERS.—The Atlas Works, Limited, have the contract to furnish two new valve chambers for the engines at the Pittsburgh Waterworks, the specifications calling for a tensile strength of 25,000 lbs. The iron they have purchased for the above castings is the "Muirkirk" brand, made at Muirkirk Furnace, Md., and specimens of it, tested on Gill's testing machine, show a tensile strength of 42,300 lbs.

COURT-HOUSE.—The County Commissioners of Austin, Minn., awarded the contract for the superstructure of its court-house to Solomon Snow, Esq., of Chicago. His bid was $52,000, but it is expected to reduce this some thousands by changing the finishing of the interior.

GAS FIXTURES.—For furnishing gas chandeliers for the new State, War and Navy departments, Shreve, Crump & Low, of Baltimore, were the lowest bidders, $6,094.50. Edward Caverly, of Washington, was next, $6,398.50. The awarding of the contract will depend upon the quality and the designs offered.

WATER-WORKS CONTRACT LET.—The City Council of Geneseo, Ill., has made a contract with P. B. Perkins to have the water-works put in first-class shape. A new fire-proof engine-house will be built, and the improvements are to be completed by July 1.

MISCELLANEOUS.

WASHINGTON, May 18, 1882.—The Senate to-day disposed of the Milson, Spendelow & Watson claim for an extension of their patent right in the steam grain-shovel used at Buffalo, by indefinitely postponing its consideration, the vote being 25 to 21. Three new interferences were declared by the Patent Office to-day between the claims of Brush and Faure, and upon their result will depend the ownership of valuable improvements in secondary electric batteries.

CITY OF MEXICO, Mex., May 14.—Congress has granted the exclusive privilege to the Bell Telephone Company to sell and operate its instruments in Mexico.

A FALL IN TELEPHONE STOCK.—LONDON, May 19.—In the Chancery division of the High Court of Justice, Justice Fry to-day gave judgment in the case of the United Telephone Company *vs.* Walker, an action to restrain the defendant from infringing on the patent for Edison's transmitter and Bell's receiver. The former point was decided against and the latter in favor of the plaintiff. Shares have, in consequence, fallen heavily.

COUNCIL BLUFFS WATER-WORKS.—The Council Bluffs Water-Works Company began on the 17th the construction of the water-works system arranged for over one year ago.

A WHOPPER.—The Cincinnati *Commercial* tells the (perhaps a) big story of a big walnut tree. In 1864 an Indiana man, as the story runs, bought the tree for $1, and he subsequently sold it for $65. The buyer sold it to a Cincinnati lumber-dealer for $700. The Cincinnati dealer sold it to a New Yorker for $2,200, and he cut it up into veneering, which he sold for $27,000.

IT has been ascertained that Christopher Columbus was not the discoverer of the way to make an egg stand on end. He was a plagiarist. It was the great Florentine architect, Brunellischi, who adopted the oval-shaped egg as a model for the dome of the cathedral at Florence. He stood the egg on end while illustrating the idea, and as he died in 1444, and Columbus was born in 1436, the priority of the discovery belongs to the Florentine. And so another historical fact is knocked out of the geography.

OLD SOUP.—During the war of 1812 the firm of Daggett & Kensett, of New Haven, contracted to supply the army with canned soup, and this was the initial step in an industry which is now of enormous extent and importance. Two cans of that soup are now in the possession of William Daggett, of Indianapolis, a grandson of the man who put them up, and, so far as can be judged from the appearance of the cans, which are still air-tight, though the tin has worn off from the heavy iron body, the soup is all ready for another war.

WINDOW SHUTTERS.—For fire-proof shutters for the public building at Philadelphia, the lowest bid was that of the United States Fire-proof Shutter and Safe Company, of Boston, at $118,235.50, and the contract will probably be awarded to that firm.

HOW HE WOULD HAVE SAVED THE JEANNETTE.—Kirk, the powder man, this morning, whacked a cartridge of Hercules powder upon the pavement in a way that made the writer's blood run cold. "I could have saved the Jeannette with a lot of these cartridges," said Kirk. "One winter I proved the explosive in an ice gorge and blew a channel open in ten minutes. Had the crew of the Jeannette been provided with these cartridges placed in holes bored in the ice and fired by a battery the ice would have been shattered as it slowly advanced and thus have been rendered powerless to crush the vessel.—*Pittsburgh Telegraph.*

OUT OF POCKET.—The contractor for the Outagamie County court-house, at Appleton, just completed, is said to be out of pocket $5,000, owing to the unprecedented advance in building materials.

TUNNEL ACCIDENT.—By the fall of an overhanging rock in the Union Hill, N. J., tunnel of the N. Y., O. & W. R. R. on the 25th, two men were killed outright, and a third so badly injured that he will probably die. There were 1,300 men at work in the tunnel at the time. The contractors are Smith, Ripley & Coleman. The accident, near Shaft No. 4, was at a depth of 135 ft.